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SCIENCE AND THE COLLEGES.*

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WE have come together to-day to do our part in raising one of the milestones which mark the progress of education in America. Our interest in higher education brings us here, and our interest in science; and, more than ever in the past, we find these two interests closely associated. More and more each year the higher education of America is becoming steeped in science; and in the extension of human knowledge the American university now finds its excuse for being.

I hope that in what I shall have to say I shall not be accused of undue glorification of science. I recognize in the fullest degree the value of all agencies in the development of the human mind. But the other departments of learning may each have its turn. We are here to-day to dedicate a hall of science. We are here in the interest of science teaching and scientific research. When, in a few years to come, we may dedicate a hall of letters, we shall sing the praises of poetry and literature. But to-day we speak of science, in the full certainty that the humanities will not suffer with its growth. All real knowledge is a help to all other, and all real love of beauty must rest on love of truth.

At this time, as we stand together by the side of the milestone we have set up, on the breezy upland which marks the boundary of our nineteenth century, it is worth while to glance back over the depressing lowlands from which we have risen; and, in our discussion of the relations of the American college to science,

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we find depression and darkness enough without going back very far.

I am still numbered, I trust, with the young men. I am sure that I have never yet heard the word "old" seriously joined to my name. When they speak of "old Jordan," I know that they mean the river, and not me. Yet, in the few years during which I have taught biology, the relation of science to education has undergone most remarkable changes.

I remember very clearly that, twenty years ago, when, in such way as I could, I had prepared myself for the two professions of naturalist and college professor, I found that these professions were in no way related. I remember having in 1872 put the results of my observations into these words: "The colleges have no part or interest in the progress of science, and science has no interest in the growth of the colleges."

The college course in those days led into no free air. *A priori* and *ex cathedra*, two of its favorite phrases, described it exactly. Its essentials were the grammar of dead languages, and the memorized results of the applications of logic to number and space. Grammar and logic were taught in a perfunctory way, and the student exhausted every device known to restless boys in his desire to evade the instruction he had spent his time and money to obtain. Then, when all the drill was over, and the long struggle between perfunctory teachers and unwilling boys had dragged to an end, the students were passed on to the president to receive from him an exposition of philosophy. This was the outlook on life for which three years of drill made preparation. And this philosophy was never the outgrowth of the knowledge of to-day, but simply the *débris* of the outworn speculations of the middle ages.

We well remember the first invasion of science in the conventional programmes of study. This came in response to an outside demand for subjects interesting and practical. It was met in such a way as to silence rather than to satisfy the demand. A few trifling courses, memorized from antiquated text-books, and the work in science was finished. The teachers who were capable of higher things had no opportunity to make use of their powers. Their investigations were not part of their duties. They were carried on in time stolen from their tasks of plodding and prodding. It is to the shame of the State of Indiana that she kept one of the greatest astronomers of our time for forty years teaching boys the elements of geometry and algebra. That he should have taught astronomy and made astronomers occurred to no one in authority until Daniel Kirkwood was seventy years old, and by the laws of Nature could teach no longer. What was true in his case was true in scores of others. The investigator

had no part in the college system; or, if on sufferance he found a place, his time was devoted to anything else rather than to the promotion of science. It is not many years since the faculty of one of our State universities spent a whole afternoon discussing a proposal to abolish laboratory work in science, and the substitution for it of good text-books and suitably illustrated lectures.

All this time, as Emerson has said, "the good spirit never cared for the colleges, and, while all men and boys were being drilled in Greek, Latin, and mathematics, it had left these shells high on the beach, and was making and feeding other matters in other parts of the world." These other matters were the study of men and plants and animals, the laws and forces of Nature, the laws which govern human life, and the manifold laws of divine workings—to which we give the name of science. Everywhere in Europe and America men were eagerly devoting their lives to this work, but in nineteen cases out of twenty these men were outside of the colleges.

Have I drawn the picture in colors too dark? In an address given in Detroit eighteen years ago, Andrew D. White used these words: "While the United States has pushed the roots of its public-school system down into the needs and feelings of the whole people, and thus obtained a deep, rich soil which has given sturdy growth, it has pushed the roots of advanced education down into a multitude of scattered sects, and has obtained a soil wretchedly thin and a growth miserably scant.

"Within the last twenty years I have seen much of these institutions, and I freely confess that my observations have saddened me. Go from one great State to another, in every one you will find that this unfortunate system has produced the same miserable results—in the vast majority of our States not a single college or university worthy the name; only a multitude of little sectarian schools with pompous names and poor equipments, each doing its best to prevent the establishment of any institution broader and better.

"The traveler arriving in our great cities generally lands in a railway station costing more than all the university edifices in the State. He sleeps in a hotel in which is embarked more capital than in the entire university endowment for millions of people. He visits asylums for lunatics, idiots, deaf, dumb, and blind, nay, even for the pauper and criminal, and he finds them palaces. He visits the college buildings for young men of sound mind and earnest purpose, the dearest treasures of the State, and he generally finds them vile barracks.

"Many noble men stand in the faculties of these colleges, men who would do honor to any institution of advanced learning in the world. These men of ours would, under a better system, develop

admirably the intellectual treasures of our people and the material resources of our country; but, cramped by want of books, want of apparatus, want of everything needed in advanced institutions, cramped above all by the spirit of the sectarian college system, very many of them have been paralyzed. Then, too, the really strong men holding professorships are too often hampered by incompetent men, whose main function was to hear boys 'parrot' text-books by rote in the recitation-room, and to denounce 'science falsely so called' in the chapel, varying these avocations by going about the country denouncing every attempt at a better system as 'godless,' and passing around the contribution-boxes in behalf of the bad system they represented."

The American college of the middle of this century, like its English original, existed for the work of the Church. If the college dies the Church dies, was the basis of its appeal for money and influence. Its duty was to form a class of educated men in whose hands should lie the preservation of the creed. In the mouths of ignorant men the truths of the Church would be clouded. Each wise church would see that its wisdom be not marred by human folly.

The needs of one church indicated the needs of others. So it came about that each of the many organizations called churches in America established its colleges here and there about the country, all based on the same general plan.

And as the little towns on the rivers and prairies grew with the progress of the country into large cities, so it was thought, by some mysterious virtue of inward expansion, these little schools in time would grow to be great universities. And in this optimistic spirit the future was forestalled, and the schools were called universities from the beginning. As time went on, it appeared that a university could not be made without money, and the source of money must be outside the schools. And so has ensued a long struggle between the American college and the wolf at the door—a tedious, belittling conflict, which has done much to lower the name and dignity of higher education. To this educational planting without watering, repeated again and again, East and West, North and South, must be ascribed the unnaturally severe struggle for existence through which our colleges have been forced to pass, the poor work, low salaries, and humiliating economies of the American college professor, the natural end of whom, according to Dr. Holmes, "is starvation."

The intense rivalry among these schools, like rivalry among half-starving tradesmen, has done much to belittle the cause in which all are engaged. At the same time, their combined rivalry has too often prevented the growth within their neighborhood of any better school.

In this connection you may pardon me for a word of my own experience, when twenty years ago I set out in search of a place for work. A chair of Natural History was the height of my aspirations; for anything more specialized than this it seemed useless to hope. I was early called from New York to such a chair in a well-known college of Illinois. But in those days the work of a college chair was never limited by its title. As a Professor of Natural History I taught zoölogy, botany, geology, physiology—of course, a little of each, and to little purpose. Then physics, chemistry, mineralogy, natural theology, and political economy, also as a matter of course. With these went German, Spanish, and evidences of Christianity, because there was no one else to take them. There finally fell on me the literary work of the college—the orations, essays, declamations, and all that flavorless foolishness on which the college depended for a creditable display at commencement. When to this was added a class in the Sunday school, you will see why it seemed necessary that the naturalist and the professor must sooner or later part company. I tried at one time to establish a little laboratory in chemistry, but met with a sharp rebuke from the board of trustees, who directed me to keep the students out of what was called the cabinet, for they were likely to injure the apparatus and waste the chemicals. When I left this college and looked elsewhere for work, I found on all sides difficulty and disappointment; for the reputation I had, wholly undeserved, I am sorry to say, was the dreaded reputation of a specialist. The question of theological orthodoxy seemed everywhere to be made one of primary importance, and candidates for chairs who, like myself, were not heretics on the subject of the origin of species, passed the rock of evolution only to be stranded on the inner shoals of the mysteries of the Scottish philosophy.

But these were not the only sources of difficulty. In one institution toward which I had looked the chair of Natural History was found unnecessary. In the meeting of the board of trustees a member arose and said in substance: "We have just elected a Professor of History. This includes all history, and the work in natural history is a part of it. Let the Professor of History take this, too"; and for that year, at least, the Professor of History took it all, and it was not hard for him to do it, for the college course in history consisted of nothing but cut straw and its preparation—that is, the reading of a chapter in the text-book a day in advance of the class was no drain on the time or the intellect of the teacher.

Even in the excellent State university into which I ultimately drifted I was met at the beginning by the caution that the purpose of my work must be elementary teaching, the statement of the essential facts of science, and by no means the making of naturalists and specialists.

I could give more illustrations, and from better schools, showing that the demand of the colleges of twenty years ago was always a demand for docility and versatility, never for thoroughness or originality; and, as a rule, the progress of science in America came from men outside of the college, and in a great part outside of college training and college sympathies; that to promote science or to extend knowledge was not often one of the college ideals, and that the colleges' chief function was to keep old ideas unchanged. What was safe in times of old will be safe to-day, and safety, rather than inspiration or investigation, was the purpose of the college. From time immemorial until now Oxford and Cambridge, the schools of clergymen and gentlemen, have been the center of English conservatism. The American colleges—dilute copies of Oxford and Cambridge—were likest their models in their retention of old methods and old ideas. The motto, once suggested for a certain scientific museum, "We will keep what we have got," might have been taken by the American college. There was no American university then, unless a few broad-minded teachers—such men as Lowell, Gray, Silliman, Henry, Baird, and Agassiz—could, as so many individuals, be properly regarded as such.

In a high sense, as I elsewhere have said, the coming of Agassiz marked the foundation of the first American university. Agassiz was the university. The essential character of the university is *Lernfreiheit*, freedom of learning, the freedom of the student to pursue his studies to the furthest limit of the known, the freedom of encouragement to invade the infinitely greater realm of the unknown. It is from this realm that come the chief rewards of the scholar. The school from which no exploring parties set out has no right to the name of university. In the progress of science, and the application of its methods to subjects not formerly considered scientific, the German university has its growth and development. In like progress must arise the American university.

You remember the story of the discussion, some forty years ago, between Emerson and Agassiz, as to the future of Harvard. Emerson, himself one of the sanest and broadest of men, saw in the work of Agassiz elements of danger, whereby the time-honored symmetry of Harvard might be destroyed. In a lecture on universities, in Boston, Emerson made some such statement as this: That natural history was "getting too great an ascendency at Harvard"; that it "was out of proportion to other departments, 'and hinted' that a check-rein would not be amiss on the enthusiastic professor who is responsible for this."

"Do you not see," Agassiz wrote to Emerson, "that the way to bring about a well-proportioned development of all the resources of the university is not to check the natural history

department, but to stimulate all the others?—not that the zoölogical school grows too fast, but that the others do not grow fast enough? This sounds invidious and perhaps somewhat boastful, but it is you," he said, "and not I, who have instituted the comparison. It strikes me that you have not hit upon the best remedy for this want of balance. If symmetry is to be obtained by cutting down the most vigorous growth, it seems to me it would be better to have a little irregularity here and there. In stimulating, by every means in my power, the growth of the Museum and the means of education connected with it, I am far from having a selfish wish to see my own department tower above the others. I wish that every one of my colleagues would make it hard for me to keep up with him, and there are some among them, I am happy to say, who are ready to run a race with me."

In these words of Agassiz may be seen the keynote of modern university progress. The university should be the great refuge hut on the ultimate boundaries of knowledge, from which daily and weekly adventurous bands set out on voyages of discovery. It should be the Upernavik from which polar travelers draw their supplies, and, as the shoreless sea of the unknown meets us on every side, the same house of refuge and supply will serve for a thousand different exploring parties, moving out in every direction into the infinite ocean. This is the university ideal of the future. Some day it will be felt as a loss and a crime if any one who could be an explorer is forced to become anything else. And even then, after countless ages of education and scientific progress, the true university will still stand on the shore, its walls still washed by the same unending sea, the boundless ocean of possible human knowledge.

The new growth of the American university which we honor to-day is simply its extension and its freedom, so that a scholar can find place within its walls. The scholar can not breathe in confined air. The walls of mediævalism have been taken down. The winds of freedom are blowing, and the summer sunshine quickens the pulse of the scholar in the deepest cloister. In the university of the future all departments of human knowledge, all laws of the omnipresent God, will be equally cherished because equally sacred. The place of science in education will then be the place it deserves—nothing more, nothing less.

Many influences have combined to bring about the emancipation of the American college. Not the least of these is the growth of the State university as an institution existing for all the people, and for no purpose but that of popular instruction. It is a part of the great training school in civics, morals, and economics which we call universal suffrage.

Most of these schools have celebrated their coming of age within the last five years, and their growth is certainly one of the most notable features in the intellectual development of America. The State university was founded as a logical result of the American system of education. It was part of the graded system through which the student was to rise step by step from the township school to the State university. It has grown because it deserved to grow. When it has deserved nothing it has received nothing. In the persistence of old methods and low ideals we find the reason for the slow growth of some of the State universities. In the early dropping of shackles and the loyalty to its own freedom we find the cause of the rapid growth of others.

In its early years the State university was in aim and method almost a duplicate of the denominational schools by which it was surrounded. Its traditions were the same, its professors drawn from the same sources, its presidents were often the defeated candidates for presidencies of the denominational schools. Men not popular enough for church preferment would do for the headship of the State universities. The salaries paid were very small, the patronage was local, and the professors were often chosen at the dictates of some local leader, or to meet some real or supposed local demand. I can remember one case when the country was searched to find for a State university a Professor of History who should be a Democrat and a Methodist. All questions of fitness were subordinated to this one of restoring the lost symmetry of a school in which Presbyterians, Baptists, and Republicans had more than their share of the spoils. This idea of division of spoils in schools as in politics is only a shade less baleful than the still older one of taking all spoils without division. And when the spoils system was finally ignored, and in the State universities men were chosen with reference to their character, scholarship, and ability to teach, regardless of "other marks or brands" upon them, the position of professor was made dignified and worthy.

The first important step in the advance of the State universities came through the growth of individualism in education—that is, through the advent of the elective system—and its first phase was the permission to substitute advanced work in science for elementary work in something else. It does not matter from what source the idea of individual choice in education has arisen. It may be a gift of far-seeing Harvard to her younger sisters; or it may be that in Harvard, as elsewhere, the elective system has arisen from a study of the actual conditions. The educational ideas which are now held by the majority of teachers in our larger schools were long ago the views of the overruled minority; and for fifty years or more individuals in the minority have looked forward to the time when inspiration and not drill would

be the aim of the colleges. "Colleges can only serve us," said Emerson long ago, "when their aim is not to drill, but to create. They will gather every ray of genius to their hospitable halls, that by their combined influence they may set the heart of the youth in flame." It was in 1864 that Agassiz said, in advocating the elective system, that although it might possibly give the pretext for easy evasion of duty to some inefficient or lazy students, it gave larger opportunities to the better class, and the university should adapt itself to the latter rather than to the former. "The bright students," he said, "are now deprived of the best advantages to be had because the dull or the indifferent must be treated like children."

In the same year Emerson spoke of the old grudge he had for forty-five years owed Harvard College for the cruel waste of two years of college time on mathematics without any attempt to adapt these tasks to the capacity of learners. "I still remember," he said, "the useless pains I took, and my serious recourse to my tutor for aid he did not know how to give me. And now I see to-day the same indiscriminate imposing of mathematics on all students during two years. Ear, or no ear, you shall all learn music, to the waste of the time and health of a large part of the class."

I remember well the beginning of the modern system in the university of a neighboring State. It came as the permission, carefully guarded, to certain students who had creditably passed the examination of the freshman year in Latin, to take, instead of the sophomore Latin, some advanced work in zoölogy. To the very great surprise of the Professor of Latin, those who availed themselves of this opportunity "to take something easy" were not the worst students in Latin, but the best. Those who were attracted by investigation chose the new road; the plodders and shirks were contented with the evils they had, rather than to fly to others that they knew not of. And so, little by little in that institution, and in all the others, has come about a relaxation of the chains of the curriculum of Oxford and Cambridge, and the extension of opportunities for students to find out the facts of Nature for themselves, rather than to rest with the conserved wisdom of an incurious past.

Thus slowly and painfully came about the development of the scientific courses. We can all remember the dreary time when, in the tedious faculty meetings, we used to devise scientific courses, short in time and weak in quality, for students who could not or would not learn Latin and Greek. There was no scientific preparation or achievement required in these courses. They were scientific only in the sense that they were not anything else. Their degree of B. S., which should have meant

Bachelor of Surfaces, was regarded as far inferior to the time-honored B. A. In the inner circle of education it was regarded as no degree at all, and its existence was a concession to the utilitarian spirit of a non-scholastic age. The scientific course was, indeed, inferior, for it lacked substance. There was no lime in its vertebræ. The central axis of Greek had been taken out, and no corresponding piece of solid work put in its place. Gradually, however, even this despised degree has risen to a place with the others. Slowly and grudgingly the colleges have admitted that under some circumstances the study of science might be as worthy of recognition as the study of Greek. When science was worthily studied, this proposition became easy of acceptance. In our best colleges to-day the study of science stands side by side with the study of language, and the one counts equally with the other, even for the degree of Bachelor of Arts. For not the Greek itself, but the culture it implies, was the glory of the course of arts. When equal culture and equal work come through other channels, they are worthy of this degree. To deny this would be to make of the degree itself a mere child's toy, a play on words. As a matter of fact it can be little more, and sooner or later the college will have no need for degrees. It was the firm belief, I am told, of Chancellor Gregory, who laid broad the foundations of the University of Illinois, that the work of the future college should need no stimulus from honors or degrees, and that these playthings of our educational childhood might some day be laid aside forever. In this feeling I fully sympathize. All these things are forms, and forms only, and our higher education is fast outgrowing them. Science has shown herself a worthy suitor of the highest degree the university can give. She will show herself strong enough to care for no degrees at all. In the great schools of the future, each study shall become its own reward. Let all come who will, and let each take what he can, and let the ideals be so high that no one will imagine that he is getting when he is not. Scholars can be made neither by driving nor by coaxing. In any profession the inspiration and example of educated men are the best surety that the generation which succeeds them will be likewise men of culture.

Not the least of the aids to freedom in science was the Morrill Act, under which a certain part of the public lands was given for the foundation of schools of applied science. Unhappily, much of this fund was wasted outright by thriftless management. Much more was in some States half wasted by the formation of separate schools for applied science, where State colleges of the old type already existed. Indeed, in many States, the college and the technical school were so far separated, that the legislators of 1868 saw in them nothing in common. Nevertheless, the highest wis-

dom in education is to bring these various influences together as much as possible. There is no knowledge which is not science, and there can be no applied science without the basis of pure science on which to rest. Schools of applied knowledge can not be legitimately separated from schools of knowledge. But, whatever the use made of the money, the passage of the Morrill Act in the interest of applied science has given scientific work a prominence in our colleges it did not have before. It has given science definite rights in the curriculum, where before it seemed to exist by sufferance.

I congratulate the State of Illinois that its university is one university; that its pure and applied science, its literature, history, philosophy, and art are taught in one institution by a united faculty. The best results in any line of education can not be reached without the association of all others. The training of the engineer will be the more valuable from his association with the classical student. The literary man may gain much, and will lose nothing, from his acquaintance with the practical work of the engineer. The separation of the schools founded by the Morrill Act from the State university, as we have seen in nearly half the States of the Union, was a blunder which time will deepen into a crime. With the union of the two has come the rapid growth of the Universities of Wisconsin, Illinois, California, Minnesota, and Nebraska, where the higher work of the State is concentrated in one place.

The freedom of choice has not worked to the advantage of science alone. The element of consent in college study has brought about a revival in classical education as well. It is not certain, even, that more science studies are chosen on the elective system than were taken on the old plan of a required curriculum. But the work is done in a different spirit. Colleges and investigators are being drawn together. There is no line of investigation in which the college can not help, if the investigators have freedom to use it. The scientific men are being drawn into sympathy with higher education. Men are now in college who under the former system would have been self-made men, with all the disadvantages that isolation implies. Education gives the ability to enter into the labors of others, and the scientific man of to-day must use every advantage if he is to make his own work an advance in knowledge. He must know what has been done by those who have gone before him. He must stand upon their shoulders if he would look further into the mysteries of Nature than they. Science can not for a moment let go of its past; and to the self-made man of science, struggle as he may, the books of the past are at least partially closed.

The men of science twenty-five years ago the college repelled,

rather than aided. I know a well-known naturalist who twenty years ago was dropped from the rolls of one of our State universities; not because he was idle or vicious or inattentive, but because he spent too much of his time studying birds, and did not keep up with his classmates in some of the conventional requirements in mathematics or Latin. The college had no use for bird knowledge, but it came out strong on irregular verbs. And so, like hundreds of others, this man went away, and carried on his own studies in his own fashion. And others similarly situated, with aspirations in science or literature, history or engineering, went away or stayed away, and grew up untouched by the higher education of their times. The elective system provides for such as these. It not only gives a new impulse to the students' work, but it brings a new body of students under collegiate influences.

Nothing in our educational history has been more remarkable than the increase in numbers of students in our principal colleges, and the corresponding increase in influence of these schools within the last ten years. Yet nothing is more evident than the fact that these students are not going to college in the old-fashioned sense. The old-fashioned college ideals are not rising in value; but new possibilities of training and the inspiration of modern thought bring to the university all sorts and conditions of men and women whose predecessors twenty years ago would not have thought of entering an American college. Where old educational ideas still reign, be the college rich or poor, there is no increase in numbers nor in influence. Unless a college education involves the emancipation of thought, unless it gives something to think about, it has no place in the educational system of the future. The future of our country will rest with college men, because the college of the future will meet the needs of all men of power, and draw them to its walls.

Scientific men have no interest in the depreciation of literary or classical training. The revolution in our higher education is not a revolt against the classics. It is an appeal from the assumption that the classics furnish the only gate to culture. It asserts the existence of a thousand gates, as many ways to culture as there are types of men. Scientific training asks only for freedom of development, and for the right to be judged by its own fruits.

With the growth of investigation has come the demand for better means of work, better apparatus, more and better books, larger collections, and especially collections for work, not for show or surprise. Better teachers are needed, and more of them. A healthy competition is set up, by which in these later days a man's pay is in some degree proportioned to his power, and the competition for places among half-starved men is changing into a competition for men among rich and ambitious institutions.

One of the great changes which have come to American education has been the extension of scientific methods to many subjects formerly deemed essentially unscientific. For this change the influences which have come to us from Germany are largely responsible. Thirty years ago the mental philosophy which formed the staple of the work of the college president was thoroughly dogmatic, like his moral science and his political economy. It was a completed subject, having its base in speculation, and its growth by logical deductions, and no thought of experimental proof or of advancement by investigation was ever brought before the student.

Now psychology is in the best schools completely detached from metaphysics, and is an experimental science as much as physiology or embryology. By its side ethics and pedagogics are ranging themselves—the scientific study of children, and the study of the laws of right, by the same methods as those we use to test the laws of chemical affinity. Metaphysics, too, has ranged itself among the historical sciences, the study no longer of intuitive and absolute truth, but the critical investigation of the outlook of man on the universe, as shown through the history of the ages. The old metaphysical idea is passing away, soon to take its place with the science of the dark ages in which it rose.

History, too, is no longer a chronicle of kings and battles. It is the story of civilization, the science of human society and human institutions. The Germans have taught us that all knowledge is science, capable of being placed in orderly sequence, and of being increased by the method of systematic investigation.

The study of language now finds its culmination in the science of philology, the science of the growth of speech. Every branch of learning is now studied, or may be studied, inductively, and studied in the light of the conception of endless and orderly change, to which we give the name of evolution. This conception has come to be recognized as one underlying all human knowledge. Seasons return because conditions return, but the conditions in the world of life never return. The present we know, but we can know it thoroughly only in the light of the past. What has been must determine what is, and the present is bound to the past by unchanging law. All advance in knowledge implies a recognition of this fact. The study of science must be grounded in the conception of orderly change, or change in accordance with the laws of evolution.

It is, after all, the presence of scholars that makes the university. It is in such men that the University of Illinois has its existence. It is located neither in Champaign nor in Urbana; it is wherever its teachers may be, wherever its workers have gone. We have met to-day to dedicate its Science Hall. To the future

work in this hall we do all honor, but we do not think of it as a new hall, nor a new creation. It is simply a natural outgrowth of the work of Burrill and Forbes. Ever since, in 1878, I visited the little zoölogical workshop of Dr. Forbes in the old school building at Normal, and ever since, in 1882, I saw toadstools and bacteria in the little room across the way which Dr. Burrill called his own, I have been able to prophesy the growth of this building. We care nothing for the brick building, its desks, its shelves, and its microscopes, as things in themselves. We are thinking of Forbes and Burrill. The building is only a better tool-house in which these master workmen can shelter their tools. Their work will be what it was before; and their impulse and example are our best guarantee that so long as this building stands we shall find in it master workmen. Another Forbes, another Burrill, another Rolfe shall fill the gaps when these lay down their work; and the University of Illinois shall live through the years, because the men who compose it are truthful, devoted, and strong.

THE FESTAL DEVELOPMENT OF ART.

By Prof. DAVID J. HILL,
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GOETHE says that art is called art simply because it is not Nature. Unquestionably it has its impulse and its laws in the constitution of man. We may, therefore, accept as useful to the proper comprehension of it, in its most general sense, the definition given by Thomas Davidson: "Art is an expression of man's inner nature imprinted upon matter, so as to appeal to his senses, which deal only with matter, and through which he obtains experience." But, while every product of art is the work of human personality, neither man nor his works can be understood, or even intelligently considered, separate from Nature. He is himself a part of her, and yet he is different from any inferior part, for he alone can, in any degree, fathom the depths of natural process or formulate natural law. When, therefore, we say with the great poet-philosopher that art is called art simply because it is not Nature, we can not mean that art is in no sense a natural activity. On the contrary, while we must accept the antithesis, we must still seek the explanation of the origin and development of art in the operation of the natural forces which are present, and the natural laws which are dominant, in the nature of man; for he, although he is Nature's child, has come into possessions which are his own.

The faculty of artistic production, aided indeed by all the

other powers of man's nature, under its guidance and command, is imagination. This is the combining faculty which, like an informing spirit, shapes the pre-existent elements and proximate forms of Nature for human needs and human pleasure. Its stimulus comes from the sphere of feeling, but its products are not the organic consequences of this stimulation. If they bore this relation of necessary effect to feeling as organic cause, they would be in the fullest sense the products of Nature, and the distinction between Nature and art would be effaced. But, in fact, the whole of man's being as rational intelligence intervenes between the impulse of feeling and the work of art. This is probably what Wilhelm von Humboldt intended when he said, "Art is the faculty of making imagination productive, according to law."

The primary impulse to imaginative activity is *utility*, the satisfaction of distinct vital needs. Of these the first is that of food, universal and peremptory for all living beings. Then shelter, clothing, weapons of defense and attack, implements, and utensils of various kinds, are demanded. In the lower animals, instinct directs the creature how to satisfy the simple organic needs; but in man, even with a low degree of intelligence, imagination contrives new ways and means of supplying these requirements. A sharpened flint serves as a knife; attached to a wooden handle, it becomes a spear; projected from a bow-string, it is an arrow. Thus, along lines of very gradual ascent, all the complicated equipment of home and chase and war was slowly acquired by the constant search for better means with which to accomplish necessary ends. In all invention, from the stone axe to the telephone, imagination has been the active faculty. The impulse of utility, "making imagination productive," has generated the "useful," "industrial," or "economic" arts; or, as the anthropologist Tylor calls them, the "arts of life."

A secondary impulse to imaginative activity is the *sense of freedom*, the satisfaction derived from a free exercise of power. After the strictly vital needs of the body are provided for, unless the whole store of force is exhausted in satisfying them, there remains a surplus, especially in the unused organs, which impels to activity not directed toward useful ends. The pressure of this exuberant energy for expression is probably the primitive impulse toward the decorative, representative, and imitative arts. These are called the "fine arts," the "æsthetic arts," and by Tylor the "arts of pleasure." In many languages they are designated as the "beautiful arts"—the Italian name being *belli arti;* the French, *beaux arts;* the German, *schöne Künste.* To these forms of art we shall confine the remainder of our discussion.

In his Principles of Psychology, Herbert Spencer begins his

last chapter with the following allusion: "Many years ago I met with a quotation from a German author to the effect that the æsthetic sentiments originate from the play-impulse. I do not remember the name of the author; and if any reasons were given for this statement, or any inferences drawn from it, I can not recall them. But the statement itself has remained with me, as being one which, if not literally true, is yet the adumbration of a truth." The author referred to is the poet Schiller, and the writing in which the idea cited by Spencer occurs is Schiller's Letters on the Æsthetic Education of Man. What Schiller is attempting to explain is not the origin of the "æsthetic sentiments," but the nature of man as an art-producing being. This nature, he thinks, grows out of the union of two impulses: (1) The *sense-impulse* (*Stofftrieb*), which determines that there shall be constant change, that time shall have a content; and (2) the *form-impulse* (*Formtrieb*), which determines that time shall be abolished, that there shall be no change. From the union of these two impulses in man results the *play-impulse* (*Spieltrieb*), which tends to abolish time in time, and to unify becoming with absolute being, change with identity. But we must not expose ourselves too long in the rarefied air of even a poet's metaphysics. Spencer, without knowing his teacher, and kindling his torch with the stray spark of Schiller's flash upon the clouds, has shed more light upon the origin of art than the poet himself.

"The activities we call play," he says, "are united with the æsthetic activities, by the trait that neither subserve, in any direct way, the processes conducive to life. . . . Inferior kinds of animals have in common the trait, that all their forces are expended in fulfilling functions essential to the maintenance of life. They are unceasingly occupied in searching for food, in escaping from enemies, in forming places of shelter, and in making preparations for progeny. But, as we ascend to animals of high types, having faculties more efficient and more numerous, we begin to find that time and strength are not wholly absorbed in providing for immediate needs. Better nutrition, gained by superiority, occasionally yields a surplus of vigor. The appetites being satisfied, there is no craving which directs the overflowing energies to the pursuit of more prey, or to the satisfaction of some pressing want. The greater variety of faculty, commonly joined with this greater efficiency of faculty, has a kindred result. When there have been developed many powers adjusted to many requirements, they can not all act at once; now the circumstances call these into exercise and now those; and some of them occasionally remain unexercised for considerable periods. Thus it happens that, in the more evolved creatures, there often recurs an energy somewhat in excess of immediate needs, and there comes also such

rest, now of this faculty and now of that, as permits the bringing of it up to a state of high efficiency by the repair which follows waste. . . . Every one of the mental powers, then, being subject to this law, that its organ when dormant for an interval longer than ordinary becomes unusually ready to act—unusually ready to have its correlative feelings aroused, giving an unusual readiness to enter upon all the correlative activities; it happens that a simulation of those activities is easily fallen into, when circumstances offer it, in place of the real activities. Hence play of all kinds—hence this tendency to superfluous and useless exercise of faculties that have been quiescent," for the mere pleasure that attends this exercise. He goes on to say: "A cat, with claws and appended muscles adjusted to daily action in catching prey, but now leading a life that is but in a small degree predatory, has a craving to exercise these parts; and may be seen to satisfy the craving by stretching out her legs, protruding her claws, and pulling at some such surface as the covering of a chair or the bark of a tree. . . . This useless activity of unused organs, which in such cases hardly rises to what we call play, passes into play ordinarily so called where there is a more manifest union of feeling with the action. Play is equally an artificial exercise of powers which, in default of their natural exercise, become so ready to discharge that they relieve themselves by simulated actions in place of real actions. For dogs and other predatory creatures show us unmistakably that their play consists of mimic chase and mimic fighting—they pursue one another, they try to overthrow one another, they bite one another as much as they dare. And so with the kitten running after a cotton ball, making it roll and again catching it, crouching as though in ambush and then leaping on it, we see that the whole sport is a dramatizing of the pursuit of prey—an ideal satisfaction for the destructive instincts in the absence of real satisfaction for them." The plays of children carry these low beginnings to a higher state. Spencer thinks that gratification from a victory at chess is a substitute for ruder victories of an earlier time. The banter of a playful conversation is also a mimic battle, in which words take the place of coarser weapons.

It would be absurd, of course, to pretend that such play is in any sense fine art, but we may see in it the impulse that sets the faculties in motion for the highest artistic productions. This we shall presently undertake to illustrate in tracing the development of the arts. As a preliminary to this, we may note the marks of differentiation which distinguish the arts of pleasure from the arts of life: 1. The practice of the useful arts is accompanied by a sense of *necessity*, growing out of the constant feeling that the process is a serious one. That of the arts of pleasure is attended with a sense of *freedom*, resulting from the surcharge of energy

directed toward less indispensable issues. 2. The useful arts derive their laws and limitations predominantly from the *objective* world. The fine arts derive theirs more largely from the *subjective* world. 3. The useful arts, therefore, partake of the *uniformity* of physical law, with its consequent monotony, so much felt in work. The fine arts, on the other hand, permit of more *novelty* and *variety*, as experienced in play.

Although the play-impulse is at the foundation of the æsthetic arts, it does not follow that art is merely the product of this impulse. Play stimulates free imaginative activity, which creates a world of its own. And we must not forget that man is not simply an imaginative, but also a rational being. The reaction of reason impresses upon the spontaneous activities the characteristics of reason as a regulative faculty—unity, order, and proportion. Thus poetry, which was at first merely the spontaneous rhythmic expression of excited feeling, with little restraint of law and almost unlimited license, is modulated at last to the stringent requirements of exact meter, a prescribed sequence of feet, and the artifice of terminal rhyme. The interval between the first wild lyric of prehistoric man and the chastened symmetry of the modern sonnet is measured by the whole diameter of human culture.

In order to approach intelligently the development of the fine arts, it is important for us to form a clear idea of what should be included under this designation, and to classify this material according to some principle. We may for this purpose start with the classification of a recent and highly competent French writer upon the subject, M. Eugène Véron. He says: "By their origin and the nature of their processes, the arts naturally divide themselves into two well-defined groups. The one springs from the sensation of sight, and is more or less immediately connected with the practices of primitive scribes. The three arts of which it is composed are sculpture, painting, and architecture. Their common feature is development in space; their manifestations have to do with a single point of time; consequently they exclude movement, which is succession and duration, replacing it by simultaneity and order, whose law is proportion. The other three arts—poetry, music, and the dance—are subject to the laws of rhythm. They have sound for their vehicle of expression, they appeal to the sense of hearing, and take their immediate origin from spoken language, which seems for long to have consisted of a species of cadenced singing. Their principle of action is by succession, through which they are referred to general ideas of lapse of time and movement. They are therefore the more direct expression of the inner essence of life, while the other three deal with it rather in its exterior forms, which, being expressed at one given moment of their action, become as it were disguised by the

very necessity under which they labor to limit themselves to a definite attitude, depriving them of the most salient characteristic of the other group of arts—movement and power of change." He then offers the following classification:

I. *Arts of the Eye:* Architecture, sculpture, painting.

II. *Arts of the Ear:* Dancing, music, poetry.

We may accept this as the basis of a grouping of the fine arts, but it should be revised in the light of two considerations: First, it is a mixed classification, for dancing does not appeal to us through the ear only, as Véron asserts, but partly through the eye also, in the case of a spectator, but mainly through the muscular sense; and, second, it is a grouping that entirely ignores the genetic element by which the several arts are evolved, if not out of one another, at least in a definite order of sequence. Both of these objections are fully met, and in addition each of the arts is characterized by its own distinctive peculiarity, if we adopt the following arrangement:

I. *Arts of Movement:*
1. Dancing—rhythmic motion of the *body.*
2. Music—rhythmic motion of the *voice.*
3. Poetry—rhythmic motion of *speech.*

II. *Arts of Form:*
1. Architecture—*decorative* form construction.
2. Sculpture—*representative* form construction.
3. Painting—*imitative* form construction.

A few words will assist us to see that this classification is a scientific one. In distinguishing between the arts of movement and the arts of form, we retain every advantage of Véron's scheme without a strained reference of the figures of the dance to the ear instead of the eye and the muscular sense, and at the same time do not obscure the close affiliation between dancing and music, which most obviously exists. The revised grouping also specifies the peculiar kind of movement and of form construction exemplified by each art. We further recognize in architecture its beginning as one of the useful arts, which, as mere form construction, it does not surpass. But when decoration is added, or rather when the decorative purpose pervades the entire plan and execution of architectural form, then for the first it becomes a fine art. The peculiarity of sculpture is, that it is representative form construction, endeavoring to copy literally, or to represent fully, the object of the sculptor's work. In the earliest sculpture, as we have no inconsiderable evidence to show, even color was employed, and this in a truly representative way, reproducing the colors of the parts represented. Painting is not strictly representative, but imitative, striving to present on a flat surface, with only two dimensions, objects which in reality occupy three dimensions of space. By the arts of perspective and foreshortening this aim is in a great degree accomplished, so that a result is produced which

is *like* the original, but not in all respects, even from an exterior and visual point of view, the *same* as the original.

It remains now to show that the grouping offered here observes the genetic principle, and arranges the fine arts in the order of their natural sequence and evolution. Véron denies that this is possible, but this conclusion can not be maintained. It is true that we have not in our possession the earliest products of art, so as to be able to prove that any order which we may assign is the actual order of development, but we have the means of showing that the order we have indicated is highly natural and probable. As regards the two main divisions, it is clear that the arts of movement would precede the arts of form, for the arts of movement—dancing, music, and poetry—may all be practiced by man without external aids or instruments of any kind, while this is impossible for the arts of form, architecture, sculpture, and painting. We might also cite, in confirmation of this view, the facts derived from the comparative study of man, which show that the arts of movement are practiced among peoples who have no arts of form, or possess these in a less perfect state of advancement than those of the first group. As regards the particular arts embraced in the general scheme, the dance seems to be the most primitive of all, because it is a simple rhythm of the bodily movements, which requires nothing else than free limbs and a tendency to bring unused muscles into exercise. The rhythm of bodily motion is naturally accompanied by vocal rhythm, which is rudimentary music, and when to this articulate words are added, poetry has begun, although in a very elementary way. As soon as the place where the dance is held begins to be decorated, the building art blossoms into a primitive architecture. When masks are used to represent deities or absent men, or representative figures of these are set up as objects of worship or reverence in the dance, sculpture has its beginning. When such effigies are imitated on a flat surface, by applying the pigments first used upon the bodies of the dancers and then on the graven images, painting as a fine art has its humble origin. Thus, we perceive, there is a natural sequence in the advent of the several arts.

It is idle to speculate upon the question as to when the fine arts had their origin. As Véron says: "Art came before thought itself. Before he ever attempted to understand or explain the conditions of the world in which he lived, man, open to pleasure through his eyes and ears, sought in combinations of forms, sounds, movements, shadow, and light, for certain special enjoyments. Traces of these early aspirations are extant in the recently discovered works of a time when his intellectual activity must have been confined within a very narrow scope. . . . When as yet he possessed neither laws nor social institutions, even then he had

art. In the dark caverns which formed his first habitations, because they alone could protect him against the attacks of beasts of prey, amid the piles of bones in which have been found the *débris* of species vanished from the earth perhaps a thousand centuries ago, we have discovered, among flint-formed arrows and knives, objects which could evidently only have been ornaments —necklets, bracelets, rings of stone and of bone—more or less roughly worked and fitted indeed, but enough to show that art is not, as has been asserted, the efflorescence of superior civilizations only. . . . Yes, those savages who lived dispersed in the holes and corners of the world . . . already felt the sentiment of art. They strove after beauty; they adorned with their best their appalling females; they decorated their weapons of stone; they devised musical instruments; by means of gravers of flint they cut upon flat bones the leading features of many animals, with enough accuracy to enable us to this day to recognize their species."

It may create some surprise that we regard the dance as the earliest form of art, or even that we allow it any place among the fine arts. To many it will seem a kind of sacrilege to combine in the same category, however broad, such extremes as a dancing savage and a painting of the last judgment; and, if the connection must be made, some would choose to make it along other lines than those of art. But, in truth, the dance supplies us with the key, so to speak, of the development of the fine arts. For light upon the problems of human culture, we naturally appeal to the anthropologist. "Dancing," says Tylor, "may seem to us moderns a frivolous amusement; but in the infancy of civilization it was full of passionate and solemn meaning. Savages and barbarians dance their joy and sorrow, their love and rage, even their magic and religion. The forest Indians of Brazil, whose sluggish temper few other excitements can stir, rouse themselves at their moonlight gatherings, when, rattle in hand, they stamp in one-two-three time round the great earthen pot of intoxicating *kawi* liquor; or men and women dance a rude courting dance, advancing in lines with a kind of primitive polka step; or the ferocious war dance is performed by armed warriors in paint, marching in ranks hither and thither with a growling chant terrific to hear." Tylor proceeds to describe the dance of the Australians, and the buffalo dance of the Mandan Indians, who, wearing masks to mark their impersonations, with rude songs and pantomimic gestures, act out the incidents of an imaginary hunt. And then he adds: "All this explains how, in ancient religion, dancing came to be one of the chief acts of worship. Religious processions went with song and dance to the Egyptian temples, and Plato said that all dancing ought to be thus an act of religion. In fact, it was so to a great extent in Greece, as where the

Cretan chorus, moving in measured pace, sang hymns to Apollo; and in Rome, where the Salian priests sang and danced, beating their shields, along the streets at the yearly festival of Mars. Modern civilization, in which sacred music flourishes more than ever, has mostly cut off the sacred dance. To see this near its old state, the traveler may visit the temples of India, or among the lamas of Thibet watch the mummers in animal masks dancing the demons out, or the new year in, to wild music of drums and shell trumpets. Remnants of such ceremonies, come down from the religion of England before Christian times, are still sometimes to be seen in the dances of boys and girls round the midsummer bonfire, or of the mummers at Yuletide; but even these are dying out."

The writers on the origin of the drama derive the tragedy of Greece, and indeed the dramatic art of the world, from simple mimetic dances, such as Tylor has described, which are found among all savage races. As Ellen Russell Emerson has said, in her curious book, Masks, Heads, and Faces: "Panoplied with the mask, representative of deity, the actor in religious rite with careful step moved in the order of the ceremonial. In the Innuit robe of evergreen boughs, or in the garment of tufted grass of the Dorian mummer, his countenance disguised with lees of wine or painted with ochre, he danced in enthusiastic mimicry of his divinity. Innuit or Greek, the same aspirations attuned the cithara or drum, the same ambition dictated the wild or solemn movement. Wheeling in weird rotation, the Selenii and satyr encircled the blazing altar on the plains of Greece. The citharist struck the measures which the mimic gestures of the chorus emphasized. Springtime, autumn, or winter, these wild ceremonies were performed in praise or appeal to the gods, in the lands of the East and of the West; with both peoples the principal object was to anthropomorphize the divinity dwelling in air or earth. Holding forth innumerable arms of appeal, barbaric Indian and barbaric Greek called on the coming of the gods."

If now we pause for a moment to consider the conditions of primitive society, we shall see that they were not such as to favor the cultivation of the independent arts, like sculpture and painting, or even architecture. The playtime of primitive man was not long enough for this. But the recurrent festival, celebrating some exploit in the chase or in war, or commemorating some departed chief, would furnish an occasion toward which men would look, for which they would prepare, and in which they would experience that pleasure which the excitement of a crowd affords, especially to the dependent mind, without resources of its own. Accordingly, it is in the festival that we must seek for those conditions in which early art was developed, and we shall find that

this is true to a surprising extent of later art also. Among primitive peoples, with very little leisure and with almost no wealth, art can develop, beyond the mere decoration of the person and the ornamentation of personal weapons, only in a social and festal way. But, as leisure and wealth increase, art rises to bolder heights, especially if the faculty for art production be native among the people.

We have seen that even the domestic animals, like cats and dogs, "dramatize" in their play. So do children in their sports. The mimetic dance carries this on another step, involving the representation of characters, absent or superhuman, and the reproduction of ideal scenes. As intelligence and skill increase, this becomes more and more removed from the simple beginnings. The Attic ceremonials in their origin were merely crude efforts at dramatization, but with advancing culture the spectacles became more elaborate. There is an interval between the dance of the Brazilian Indians around their earthen pot of smoking *kawi* liquor and the Attic festival of Bacchus, performed in a great marble theatre, or temple of Bacchus, with a sculptured statue of the god in the center, the full chorus chanting to the accompaniment of many instruments, the walls of the temple adorned with heroic-size paintings of the exploits of the divinity; but it is only the interval between the first and the middle chapter of the same history. If, in a great modern city like Paris, we were to select the places where *all* the fine arts are most fully represented at once, we should not choose the palaces and the museums—for here the arts of movement are not represented—but the great churches and play-houses, especially Notre-Dame and the Grand Opera House. In Notre-Dame we should find music, poetry, architecture, sculpture, and painting, all combined. Only dancing is eliminated as an outgrown element of ceremonial. In the Grand Opera House we should find *all* the arts, and the one omitted at Notre-Dame would be most conspicuous there. The festal dramas of early times have been specialized, the religious ceremonial being separated from the secular, which finds its modern equivalent in the opera, where all the arts remain united. It is not meant that the *best* art in Paris is to be found at the opera house, but it is the kind which at the present time best represents the art appreciation of that city. Its attractions are offered every night, those of the *salon* once a year.

However paradoxical it may seem at first, reflection confirms the statement that the drama is the synthesis of all the fine arts, and the festival the common air from which all have drawn their first breath of life. If we start with the opera, for example, as a present fact, and inquire when and how it combined in itself the separate arts which it certainly unites, we shall find no point

where these arts, independently developed, were first brought together for this purpose. We shall find, on the contrary, that every form of the drama was derived from some simpler form in which all the arts were constituents, until we arrive at the mimetic dance as the prototype of the whole series of dramatic phases. We are by no means justified in supposing that, at some time in the past, near or remote, a sculptor, without predecessors or examples, inspired by the impulse of a divine genius, modeled for himself a perfect human form in clay, and then with chisel and hammer proceeded to disengage a copy of this form from the solid marble. As little can we suppose that a great painter, without antecedents or training, arose in the midst of an inartistic generation, stretched his canvas, mixed for the first time his pigments, and executed a landscape or an ideal head. This is not in analogy with other lines of human development. As every great orator was once a speechless infant, finding language ready for his tongue and comprehension in his hearers, so every great artist has found a language of artistic expression waiting for his genius to improve and lovers of art ready to enjoy his creations. And thus we see that as the mechanic arts do not blush to confess that every wheel in every watch and every factory owes its parentage to the discovery that a fallen tree-trunk will roll under pressure, which probably first revealed the principle of the wheel, so the fine arts need not be ashamed of their descent from the mimetic dance. Let no idealistic devotee of art, therefore, be shocked or offended if we say that all the fine arts were at first incidental contributions to the dramatic festival, and afterward were analyzed out of this common medium of their development as independent forms of culture.

In all dramatization music has had a large place, either as the recurrent drum-tap, the percussion of cymbals, the twanging of stringed instruments like the tetrachord of the Greeks, or the blowing of pipes and horns. Between the intervals of dancing it is common in primitive ceremonies for some person to sing a few words alternated with a uniform chorus—and such, it has been suggested, might be the origin of the Greek strophe and antistrophe, "which are thought to represent the two movements of the universe from east to west, and west to east, the choir performing their dances around the altar of their gods from right to left and left to right." Thus was developed a lyric which gradually expanded into a poetic story. This, in time, developed into the recital of the rhapsodists who sang at the public festivals, which were largely dramatic in their character, and these fragments of heroic verse united and amplified become at last great epics like the Iliad and the Odyssey.

The relation of architecture to the festival is very easy to

trace. The most ancient architectural remains are huge monoliths, undoubtedly intended as monuments of the dead. Perhaps hardly less old are the dolmens, or flat stones laid horizontally upon several tall upright pillars; and the cromlechs, or circles of rude stones, indicating a place of assembly or the marking off of a sacred inclosure. All these are probably early tombs. The tomb is, among primitive people, a place of religious festival. It becomes a shrine of the deified hero. Around it the living gather to celebrate the deeds of the dead and to invoke his blessing. The tomb-shrine gradually becomes a temple. The whole history of the development of architecture shows the shrine as the constant center about which are arranged the pillared halls, the colonnades, the ornate portals, the ornamental courts, and the sculpture-lined avenues of the most elaborate temples. Prof. G. Baldwin Brown says, in his recent manual on the fine arts: "Through a fortunate circumstance we are able to get behind these elaborate constructions, and learn the arrangements which preceded them in respect to the shrine and its furnishing forth. The pictures in the Egyptian hieroglyphic writing supply us with minute but extremely spirited delineations of structures and objects which may have been familiar to the inhabitants countless generations earlier than the erection of the tombs and temples that remain to us. Among these pictures are one or two representing small huts or arbors of rustic work. These, we learn, are shrines of the gods, and they represent the original shape of the sacred chamber, which remained to all time as the heart and kernel of the vast temples of a Seti or a Rameses. . . . Religious worship, it need not be said, is infinitely older than the permanent temple, and for its performance all that was needed was a gathering of the pious at a sacred spot about a rustic altar, to which might be added a movable ark, or a fixed hut or canopy for the safe keeping of any totem or apparatus of secret mummery belonging to the local divinity. Given such a permanent structure, the approach to it would be specially hallowed ground and fenced off from profane tread. Any simple device, such as a lofty flagstaff, would be adopted to give it importance from afar, and on the occasion of the festival every kind of decoration in the form of fluttering streamers, branches of green trees, and garlands of flowers, would be lavished on the building and its approaches. Here, in the little Egyptian shrine, we see at the entrance two lofty flagstaffs, and in front the indication of a palisade, evidently marking off the sacred precinct, or *temenos*. . . . Now it will be recognized that we have here, reduced to their simplest terms, just the same elements that went to make up the vast complexus of the monumental temples of Thebes or Abydos. The shrine remained as it had been, though now wrought in stone. The chambers round about it in

the hinder portions of the temple were lodgings of the priests and storerooms for the offerings of the faithful; the courts and columned halls were merely developments of the palisaded inclosure. The flagstaffs actually remained till the latest times erect on each side of the single entrance to the temple, though the idea of them was still further carried out in monumental fashion by the rearing of two vast, almost completely solid masses of masonry of tower-like form, called *pylons*, that flanked the gateway and gave the desired imposing aspect to the approach toward the shrine." The writer goes on to show that a similar account might be given of "the most important monument in the whole history of architecture—the temple of the Greeks."

The manner in which sculpture contributed to the festival is also obvious. In the mimetic representations which formed a part of all the primeval religious ceremonies (and all early festivals were in some sense religious) the mask was an important factor. Much curious and suggestive lore regarding masks in all ages is to be found in a work previously referred to on Masks, Heads, and Faces. The earliest disguise was effected by the use of lees of wine mixed with black earth. This, applied directly to the face, served as a mask. Then vegetable shells and wood, later baked earth and stone, and finally metals, served a better purpose. The object was to impersonate the absent, usually a hero or a god, or the animal in which the deity was fond of appearing. "Certain lines were traced upon the masks used in ceremonial dances, and in the protection of the face of the dead, whose meaning can be understood only by a knowledge of the customs, traditions, and superstitions of the people among whom they were used. These lines are not only found on the wooden masks, but on the terra cotta and plaster, and also upon cocoanut and gourd masks. There is reason to believe that, in the case of the terra cotta, the devices were fac-simile to the tattoo-marks on the face of the deceased, the mask in this case being intended to insure preservation of the cherished lineaments, and also affording means of identification. . . . The custom of the use of portrait-masks survived in Roman burial service, when the lineaments were made in wax, and worn by his representative with a costume of the dead dignitary. From this ceremonial arose a more extensive fashion of carving the features in marble." But the same tendency had earlier shown itself in Egypt and Assyria, and preeminently in Greece. Not only real but also mythic beings, first impersonated in the festival, were carved in marble for its future ornament. "The solemn representations of the gods in the circling dance about the archaic altar admitted of no irreverent hilarity. Thus were presented the movements of the sun and moon, accompanied each by a retinue of lesser gods; for to the

solar god were ascribed the Selenii, deities of the woodlands, and to the moon-goddess the Naiads of the flowing streams. And there appear also satyrs, those happy genii whom the sculptor had delighted to picture as the souls of the forest, unwitting of sorrow; of these human-eyed creatures the artist often chose representation in mask, with open look and parted lips, common feature of Hellenic sculpture—an expression of unchecked animal sweetness, no muscle drawn or compressed, and with all the unalarming hint of furry ears and budding horns!"

Painting, except as pigments were applied to faces, masks, and architectural adornments, had a relatively small place in the primitive festivals, as indeed it had in all ancient as compared with modern art. The whole theory of perspective was unknown, without which painting limps and halts. Still, we may see how it could contribute to the festival at a very early stage by the practice of the Sioux in their mimetic elk dance. When the sacred animal appears to a brave in a dream, a tent is placed with an opening to the east, and decorated at the top with four bands of blue, while across the entrance the figure of an elk is delineated with red paint, so arranged that the visitors shall pass through its body. Here is a crude contribution of painting to a very primitive festival. Of course, the evidence concerning the extent to which painting entered into the early festal performances can be only indirect. But it is important to note that the art of writing is derived from that of drawing, and that all the earliest forms of written language are pictographic. And they were also the special possession of the priests who had charge of the religious festival. It is more than probable that writing originated from the attempt to produce a series of pictures of early festivals, either religious or triumphal, or both—for victory was always celebrated with religious rites. Beginning thus as a series of rude imitative drawings, writing passed into more and more symbolic stages, among the Egyptians traversing the clearly marked phases of hieroglyphic, hieratic, and demotic writing, supplying the Phœnicians with the alphabet, whose crude characters were transported to Greece, and these—considerably modified—to Rome, whence we derive those letters with which we print our books and newspapers. Very early, then, was drawing known as a fine art, although imperfectly developed. Color was used on the earliest statuary. The independent statue, fashioned either in stone or wood, appears in the oldest Egypt, and has about it a good deal of that crude realism which marks the infancy of representative art. The flesh is colored up to correspond with Nature, the flesh of women being tinted a lighter hue than that of men; the eyes are represented often by some special material; the drapery is painted. The earliest statues of the gods of Greece were

of a similar kind, only ruder and more childish in their realism than those of Egypt. The wooden doll was made as lifelike as possible by being dressed up in real clothes with a wig of hair, and with accessories or arms in actual metalwork and jewelry. These realistic images were highly honored from a religious point of view, like the *bambino* of the church of Ara Cœli, in Rome, at the present day, and were undoubtedly copied from a living effigy in the festival, as this *bambino* is now carried in the ceremonial processions at its annual *féte*. Still further light is thrown upon the subject by the religious symbolism of colors among widely separated peoples. Among the Chaldeans, the planetary gods were all symbolized by colors, yellow standing for the sun; black, for the moon; red, for the planet Mars; pale yellow, for Venus; and blue, for Mercury. So, among the Indians, green is ascribed to Venus, purple to Jupiter, and black to Saturn. All this finds its easy explanation in the color given to the representative of the god in the festal dance.

If, now, we have established our thesis, it appears that the fine arts are only the various modes of expressing the strong feelings awakened by religion and other potent stimuli of the imagination finding utterance under the social conditions of the time, and giving form in material sign and symbol to otherwise incommunicable sentiments. An analytical and philosophizing age is not particularly favorable to the production of the fine arts. They thrive best among an impressible, imaginative, spectacle-loving people. All history is a witness of this. The art of Egypt is the record of its religious rites and ceremonies, its military triumphs, and its royal processions. The same is true to a great extent of the art of Greece. The most of its sculpture is copied from figures seen in the dance, represented in the great festal games, or in the religious celebrations of the people. The marbles once in the frieze of the Parthenon, many of which were taken to England by Lord Elgin and placed in the British Museum—known as the "Elgin Marbles"—are copies from the Panathenaic festival as a spectator might have beheld it when all Athens contributed to its magnificence. The Italian *rappresentazioni*, most splendid at Florence, gave inspiration to the great painters of the fourteenth and fifteenth centuries. As these spectacles increased in beauty and artistic excellence, so did the paintings copied from them, for here the painter found his living models, already works of art in personal beauty and costume. The artists actually took both their themes and characters from these pageants. The "miracle-plays" and "mysteries," their equivalents north of the Alps, were less impressive, but these also kindled the flame of art and almost created the northern painter. There was also in Italy the *trionfo*, or procession of masked and costumed mummers, representing

sacred, mythical, and allegorical personages, in a blazonry of symbolic adornment. A fine description of these and how the artist worked from them may be found in Brown's manual on the fine arts to which reference has been made.

Artistic inspiration arises from the stimulation of the imagination, the faculty of movement and form, by some strong feeling seeking expression. Among the feelings which have been most productive of such stimulation we may mention the religious sentiments, which open a limitless field for imaginative activity; the emotions of love, which stir imagination to the delineation of human beauty; the moral sentiments, which excite it to portray the heroic and sublime qualities of character; and the passion for natural scenery, which attracts it to the representation of the beautiful in Nature. All these feelings awaken a faith in some higher possibility, opening the quest for the ideal, or beauty stripped of its imperfections. Art thus becomes the appeal of personality to personality, of intelligence to intelligence. Its highest office, toward which it has been slowly striving, is to serve as a language for the embodiment and communication of ideas and sentiments which have a value for human sensibility. As Emerson has tersely said, "Art is the path of the creator to his work."

THE CORRELATION OF STRUCTURE, ACTION, AND THOUGHT.*

By T. LAUDER BRUNTON, M.D., F.R.S.

MR. PRESIDENT AND GENTLEMEN: Allow me to return you my most grateful thanks for the honor which you have done me in asking me to address you to-night. I believe that there are none here excepting myself who can understand how grateful I feel, because no one else can know how much I owe to this society. I have been compelled during my life to do a good deal of speaking and of writing, and yet these are the two things which above all others I dislike and for which I am naturally entirely unfit. Had it not been for the training which I received in this society I do not think that I should ever have been able to speak in public at all. In relation to speaking and writing, I often recall an anecdote told me by my poor friend the late Dr. Milner Fothergill, regarding a beaver which an American said he had chased so hard that it had been forced to climb up a tree to escape him. "But," said his hearer, "beavers

* Inaugural address delivered at the Royal Medical Society of Edinburgh on October 21, 1892. Abridged from the London Lancet.

can not climb trees." "Well," replied the American, "I guess this one had *just got to*." Now this society played to me the part that the American did to the beaver and forced me both to speak and write, and I am therefore very grateful to it. My first attempt at writing was the dissertation which the rules of the society demanded, and my first attempt at speaking was made in this room when I stammered out half a dozen words, each one broken into bits by the palpitations of my heart, and then thankfully sat down.

But it is not only in speaking and writing that I owe my training to the Royal Medical Society of Edinburgh, I owe to it also my first initiation into scientific methods—my first instruction in scientific skepticism. I well remember that on one occasion a member made a certain statement; he had no sooner sat down than he was challenged by my friend Dr. John Wyllie. The first member again rose to his feet and maintained that his statement was true, and that his facts were correct because Professor So-and-so had said so. Again Dr. Wyllie rose, and with the simple question, "But is Professor So-and-so right?" swept away the ground from under his opponent's feet and gave me a new insight into scientific evidence. Previously I had been inclined to accept all the dicta of the professors as gospel truth, but from that time onward I accepted them only with the proviso that Professor So-and-so might possibly be wrong. Training like this, gained by a student in the discussions at the meetings here, is of the utmost possible importance as supplying a valuable part of medical education and complementing the instruction which he gains in the lecture rooms; it enables him to sift the statements which he there hears and to assimilate them in his own mind, so that they become as it were part of himself, and afford him a basis of knowledge upon which he not only can act in daily life, but from which he may advance onward and benefit both his profession and the world at large by new discoveries. This training is so invaluable that I should look upon anything which would interfere with it as detrimental to the student; for a little knowledge, like a little food, if well assimilated, is more useful than an undigested mass, which may be not only useless but positively injurious.

The numerous discoveries which have been made during the twenty-nine years which have elapsed since I first took my seat in this hall as a member of the society have tended to increase the mass of facts which the student has to learn; and the numerous examinations have tended to foster a system of cramming which is totally distinct from that of true education. For the purpose of examination the student is tempted to load his memory with many details and to learn by heart statements which may or may not be true, simply for the purpose of committing

them to paper and thus gaining good marks in competitive examinations without considering in the least whether these statements are true, or whether the facts, so called, are likely to help him at all in his future life. The period during which I regularly attended the meetings of this society was a transitional one, because the number of examinations, competitive and professional, was then beginning to increase. I trust it is not true, but I have heard that since my time the examination incubus has been weighing even more heavily upon men than it did then, and has been interfering to some extent with the activity of the discussions in this society. Yet even if it were true it can hardly be wondered at, for it seems to me that we are living at a period which is not only one of the utmost activity, one of the most startling progress, and one of the keenest excitement for all engaged in research, but at the same time it is one of the utmost difficulty for all those who are engaged in the study of medicine, surgery, and the allied sciences. For the number of facts is not only enormously great, but is daily increasing at a rate which threatens to make it almost impossible for any ordinary memory to retain them all. Yet the darkest hour is that before the dawn, and I believe that shortly medical study will become very much easier. The great difficulty that the student has in remembering facts is that they are isolated and not co-ordinated together. In a book on memory which I once read the writer summed up his whole science in one sentence: "Observe, reflect, link thought with thought, and think of the impressions." This is easy to say but not so easy to do, and it is the difficulty of linking thought with thought that makes the tax upon the memory of the medical student so exceedingly great.

Now it seems to me that one of the objects which this society should set before itself should be not only that of training its members in the art of speaking and writing, of sifting facts and criticising statements, but of linking together and co-ordinating the data which they are called upon to recollect. When the science of astronomy was younger and the earth was supposed to be the center of the universe, the motions of the planets were known with sufficient certainty to calculate eclipses, but they could only be brought into conformity with their supposed relationship to the earth as the center by the most cumbrous system of hypotheses, and by ideas of cycles and epicycles which must have burdened the astronomer's memory to the last degree. So soon, however, as the sun and not the earth was recognized to be the center of our system the whole of the observed facts were seen to be in complete harmony, and the relationship, comparatively speaking, as simple as A B C. In our own time we have seen somewhat similar occurrences in regard to the relationship of animals and

plants, or I might shortly say, of all living creatures to one another. It used to be assumed that the highest plants and highest animals were to be compared together, but all attempts to make this comparison rationally were unsuccessful; and it was only when an old member of this society, Mr. Charles Darwin, pointed out that animals and plants had sprung from one common ancestor and had diverged in different directions that the various relationships became intelligible. I well remember that when learning botany it puzzled me greatly to understand why the shape of the ovary, the nature of the ovule, and the position of the embryo should be such important characters in determining the genus of plants, and I devoutly wished that plants had been made in such a way that one could settle their nature by characters visible to the naked eye and not requiring a pocket micro-

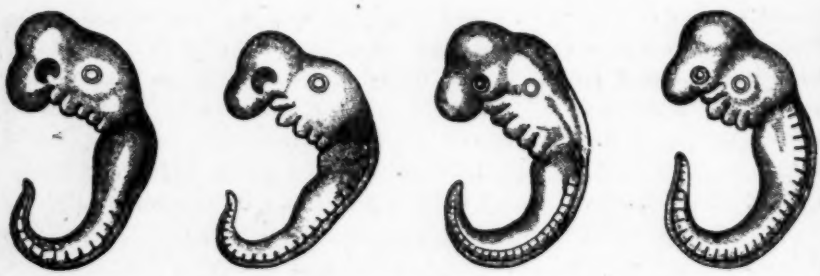

FIG. 1.—CHICK. FIG. 2.—TORTOISE. FIG. 3.—HOG. FIG. 4.—MAN.

(After Haeckel.)

scope. But the reason for all this at once became evident when the Darwinian doctrine showed that it is in these embryonic characters that relationships are to be discovered and that it is in later development that differences occur. As Haeckel has shown, the embryos of the fowl, the tortoise, the hog, and the man, are all nearly alike in the early stages of fœtal life (Figs. 1, 2, 3, and 4), utterly different as these creatures may be when they have attained their full development — the Darwinian doctrine has thrown a flood of light on the relationship of plants and animals, and shows us that when animals have got as it were on the wrong track, however far they may go in it, they never come to anything very good.

Nobody expects much of a jellyfish. Its soft, pulpy substance is incapable of anything but the simplest movement, and no animal that has not something hard to steady it can greatly excel the jellyfish. The soft mollusks which use their hard casing only for protective purposes, like the oyster and the snail, are bound to stay low in the scale of existence, and the highest mollusk (the octopus) appears to be striving after something better, but only

by the aid of an attempt at a skeleton—the so-called cuttlefish bone. But this has no joint in it, and even the octopus does not amount to much. Articulata with their jointed skeletons have reached such a pitch of social organization as to be held up for examples to mankind, and ants and bees are regarded by some as almost the mental equals, if not the superiors, of some of the savage tribes of mankind. But the outside skeleton is a sore disadvantage, for the animal must either remain without growing in

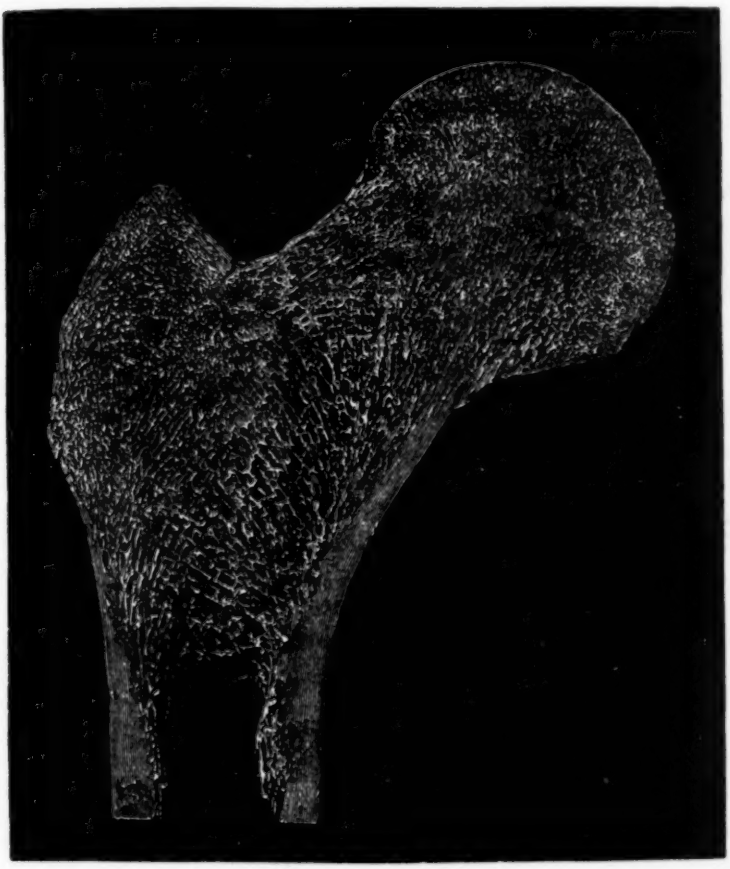

FIG. 5.—SECTION OF HEAD OF FEMUR, to show the arrangement of the fibers of bone so as to give strength to it. (From Donald Macalister.)

size, or else it must be periodically cramped for room, and periodically burst its shell, leaving itself naked, weak, and defenseless. The right thing to do is evidently to do like the vertebrata, and have the hard parts inside, and the soft parts outside; but the relationship of these parts is a sore task upon the student's memory, and to many a one anatomy is a burden too heavy to be

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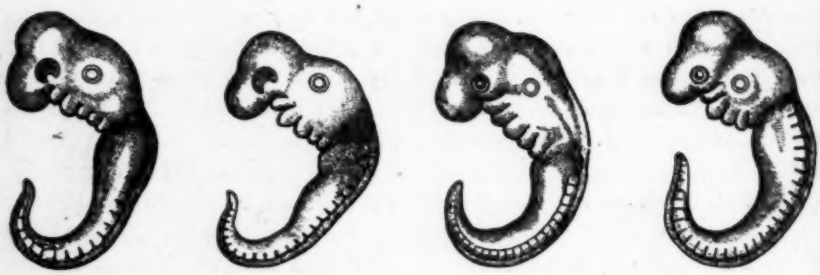

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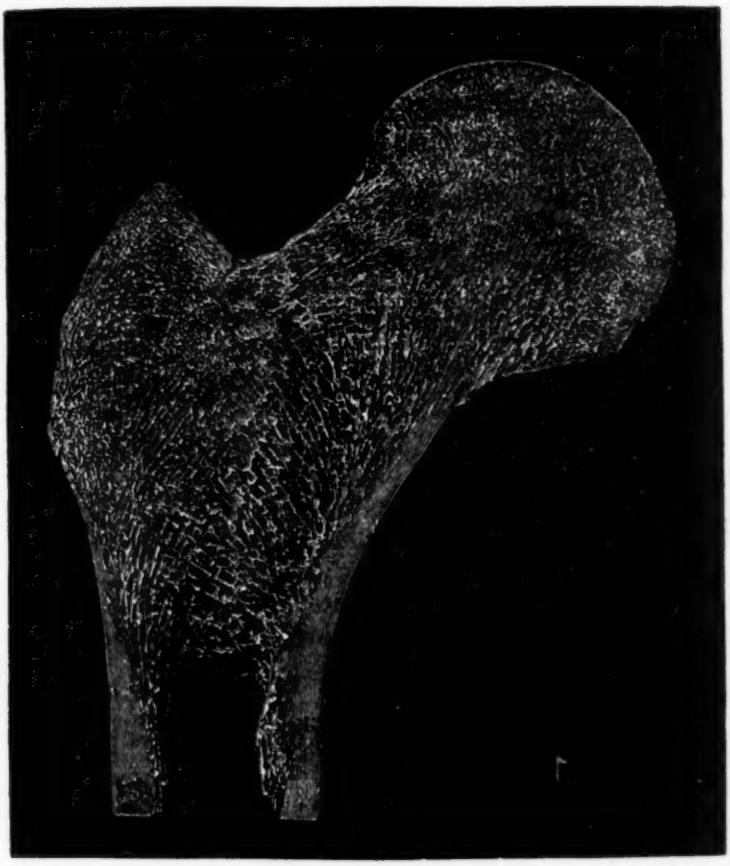

FIG. 5.—SECTION OF HEAD OF FEMUR, to show the arrangement of the fibers of bone so as to give strength to it. (From Donald Macalister.)

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borne, and the unfortunate youth is forced by it to leave the study of medicine and turn his attention to some easier pursuit.

Now, I think that with a little trouble one may find a way of linking anatomical relationships together in a more rational way than that of "Bodfi," a word which in my student days was used as a mnemonic to describe the form of the hippocampal convolution of the brain—backward, outward, downward, forward, and inward. The word also served to describe the course of the ribs, but Dr. Anderson Stewart has shown us how naturally the peculiar twist the ribs take in a man arises from his upright position. Taking a circular steel hoop, and simply hanging it up by one side, he shows that it assumes an oval shape, like that of the thorax of animals going upon four legs and whose ribs hang vertically from the spine. On raising this up by one point it becomes twisted upon itself and takes precisely the peculiar bend which the ribs possess in man. The advantage of a naturally jointed skeleton is so obvious that I need not further discuss it here, nor need I discuss the texture of bone which has been so admirably treated of by my friend Dr. Donald Macalister, of Cambridge (Fig. 5).

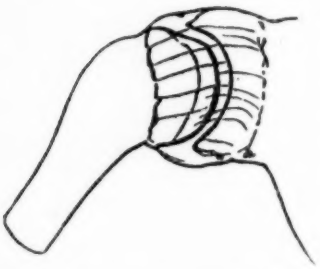

FIG. 6.—DIAGRAM OF SHOULDER JOINT. to show the capsule.

The ligaments and the joints were to me most puzzling until Dr. Joseph Bell pointed out to me how very simple they were. What is wanted in a joint is a capsule to go round it so as to hold the ends of the bones together and prevent the synovial fluid from oozing out. If the bones have to move freely in all directions they must have a ball-and-socket joint, as at the shoulder (Fig. 6) and at the hip, and there you will have a simple capsule because it can not be particularly strengthened at one point or another without interfering with freedom of movement. In the case of a hinge-joint, such as those of the fingers or toes, elbows or knees, you will have the capsule remaining thin at the front and back so as to leave the movement free, but you will have it strengthened at the sides so as to tie (Fig. 7) the bones more firmly together, and the stronger parts are called lateral ligaments. If several bones have to be connected, each one must be tied first of all to the one nearest it, and then two or three must be tied together at a time, and in this way we get the network of ligaments which we find at the wrist and tarsus (Fig. 8). The same thing is true

FIG. 7.—DIAGRAM OF LIGAMENTS OF PHALANGES —a capsule and lateral ligaments.

of muscles, and, as Prof. Goodsir used to point out, the muscles of the back, so perplexing at first, are really quite simple in their arrangement. For each of the spinal vertebræ has to be bent and straightened and has also to rotate more or less upon its neighbors, so as to allow the upper part of the body to swing round upon the lower. We have, therefore, muscles going from the spine of one vertebra to the spine of the next, and then muscular strips stretching over a few and then over many vertebræ, so as to straighten the spine either in part or whole, as the movements may require. A similar arrangement holds good for the muscles passing from the spines to the lateral processes and which rotate the vertebræ on one another.

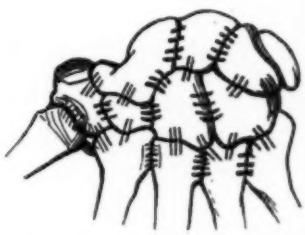

FIG. 8.—DIAGRAM OF THE LIGAMENTS OF CARPUS, as seen from behind. Besides these there are ligaments passing in various directions, so as to bind the bones more firmly to each other.

But if we are to group the muscles and nerves of the body into one easily remembered whole, we must see what is the chief function to be subserved by them, what is the center of the little universe which they compose. The function of most imperious necessity is respiration. A man may starve himself to death, but he can not kill himself by holding his breath. He may refuse food, but can not refuse air. In the child the function of respiration is the first which evidences itself after birth, and the muscles which subserve it are more fully developed and more perfectly innervated than others. The nerve channels which supply them are, as it might be termed, more deeply grooved than others, and it is along these channels that superabundant energy overflows in the movements of laughter which evidence joy. This has been very fully and wisely explained by Herbert Spencer in his essay on Laughter. But the great poet, whose recent death the whole civilized world is now deploring, has classed together in a few pregnant words the channels through which the overflow of energy may run in their proper order. In describing the joy evinced by a baby on seeing its mother, Tennyson says it

> "began
> A blind and babbling laughter, and to dance
> Its body, and reach its fatling innocent arms
> And lazy lingering fingers."

The very parts which attain to the highest development in adult age, and are capable of the finest and most dexterous movements, are the last to develop, and in infancy they are well described as "lazy lingering fingers." They take no part in the function of

respiration, but they are of the utmost utility in the function which comes next to respiration in importance—namely, that of nutrition. The animal has to be fed, and all the arrangements of the limbs are more or less subservient to this primary object. In a fish the muscular masses at both sides of the spine bend the posterior part of the body and the tail alternately to one side or another, and so the animal is propelled through the water in search of food. No doubt these same muscles help it to escape danger, but their primary object is to obtain food; and if there be great hunger all animals will strive to feed, whatever be the risk they run in doing so. The movements of fish are simple com-

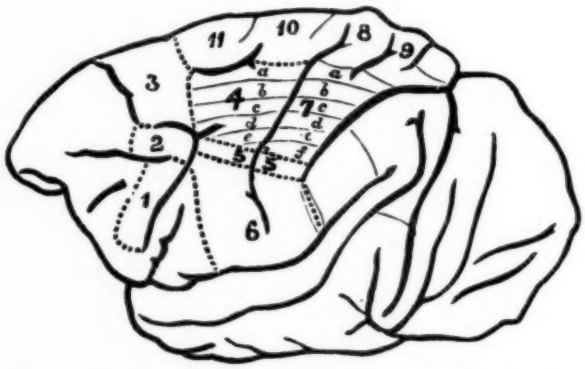

FIG. 9.—DIAGRAM OF THE MOTOR CENTERS IN THE BRAIN. (Modified from those of Ferrier and Horsley.) The motor centers have been numbered so as to represent the successive actions in seeing, taking, and eating the apple, etc.: 1. Eve sees the fruit (eyes turn to opposite side). 2. Looks more eagerly at it (head and eyes turn). 3. Turns toward it (head to opposite side). 4. Puts forth her hand to take it (*a*, movements of shoulder; *b*, of elbow; *c*, of wrist; *d*, of fingers). 5. Luxuriously shuts her eyes, so as to enjoy the sweet morsel more thoroughly. 6. Eats the apple. 7. Picks out and throws away the refuse (*d*, movements of fingers; *e*, of index; *f*, of thumb; *a*, *b*, *c*, as in 5). 8, 9, 10, 11. Went and got another for Adam (8, movements of hallux; 9, of small toes; 10, of knee and ankle; 11, of hip).

pared with those of animals with limbs, and especially with those of man. Yet the arrangements of man's body are equally adapted with those of the fish for obtaining food.

There are two prevalent ideas regarding the origin of man. One is that he started full grown and perfectly developed from the dust of the ground, and lived in a garden which he "dressed and kept." The other is the Darwinian one, that man is developed from an arboreal animal like the monkey, though lower than the monkey. It matters not which of these ideas we take, because they perfectly agree that primitive man lived at first in a kind of paradise where he was not exposed to the attacks of wild beasts, and where he fed on the fruit which he plucked from the trees around him. The story of Adam and Eve has got the advantage of not only being more poetical, but it is very much

more easy to discuss the actors in the scene by the names of Adam and Eve, than by the terms "male" and "female frugivorous animal."

Let us take then the story from Genesis. One day Eve went into the garden of Eden—saw an apple upon a tree—plucked it, ate it, and then went to get another for Adam. In trying to analyze the muscles concerned in these acts, the easiest way is to go to your bedroom, strip off your clothes, imitate Eve's action, and as you do so, feel out the individual muscles as they contract under the skin. This plan of learning the muscles is one which I used to follow as a student of anatomy, and I found it a very useful one indeed. If you do this you will find the muscles of the neck, shoulder, arm, forearm, and hand contracting successively or together in co-ordinated movements, which are beautifully adapted to the purposes just mentioned. We might take the muscles which produce these movements one by one, but I think it is easier for the purpose of grouping them, though not so good for the purpose of study in your own room, to consider first of all the motor centers in the brain from which the stimuli proceed. Before proceeding to consider these I wish to draw your attention to the errors into which one may fall regarding the action of muscles as well as of the motions of the planets by regarding them from a wrong point of view. Thus, the action of the tensor vaginæ femoris is usually said to be that of rotating the thigh inward upon the body and thus turning the foot and toes inward also, an action which is denounced in all calisthenic exercises. But this muscle was not introduced into the body for the sole purpose of plaguing drill sergeants and dancing masters. As the late Prof. Sharpey used to point out, we ought to look at its action from the leg as a fixed point, and then we discover its true uses at once. Place your hand at the side of the hip over the muscle and march forward. You will then find that when one foot is planted firmly on the ground the corresponding muscle becomes tense whenever you lift the other leg and try to advance it. Whenever the other foot is raised the

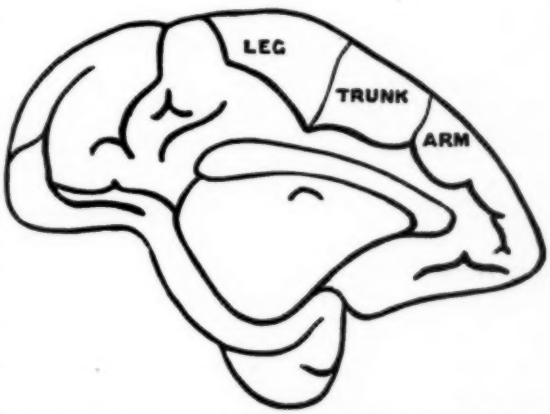

FIG. 10.—VIEW OF A LOBE OF THE CEREBRUM FROM THE LONGITUDINAL FISSURE. (After Horsley and Schäfer.)

muscle rotates the body outward on the fixed thigh and thus brings the center of gravity of the person over the resting foot. If it were not for these muscles we should run a risk of falling down as we lifted one leg instead of balancing ourselves with comfort upon that one which is resting upon the ground.

But we may now pass away from the muscles and nerves to the nervous centers from which they receive their stimulus to action, and whatever doubt may exist in regard to the adaptation of the muscles to the peripheral nerves and the action of plucking and eating the apple, I think there can be no doubt at all that such an arrangement exists in the motor centers of the brain. These centers were localized in the monkey by Ferrier, and it is the difficulty I have had in remembering their position that has led me to arrange them in accordance with some definite movements in a series of actions to which I have found they corresponded.

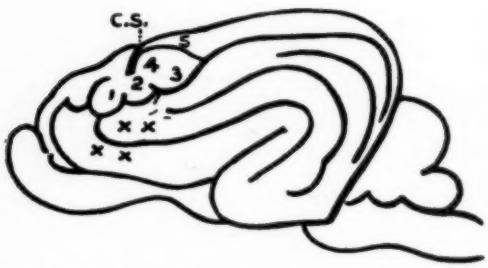

FIG. 11.—DIAGRAM OF BRAIN OF DOG. (After Ferrier.) C. S., Crucial sulcus. 1. Movements of eyes, as if to see freely. 2 and 3. Movements of fore leg, and 4, of hind leg, as in running. 5. Movements of tail requisite in turning quickly, as when a greyhound is following a hare when it doubles. × × × Movements of mouth and jaws.

If we start from the posterior part of the second frontal convolution, pass upward along it and then across to the ascending frontal convolution, follow this downward parallel to the fissure of Rolando, and then turning the end of this fissure ascend again upward along the parietal convolution which lies behind the fissure, we find (Fig. 9) that the centers are arranged in the very order required for looking at the apple, stretching out the hand to take it, bringing it to the mouth, separating the seeds and throwing them away. The aim and object of the whole series of actions is to eat the apple, and we find that the centers for doing this are situated exactly where we should expect them—at the very end of the fissure of Rolando. In Ferrier's description we know that the movement which brings the hand to the mouth appears to be repeated on both sides of the fissure of Rolando, but it appears that the part anterior to the former would bring the hand to the mouth with the apple, while the part situated behind the fissure of Rolando would throw the remnants of it away. And here comes in a very interesting point: In order to complete the series of actions necessary for Eve to go and get another apple for Adam, you require movements of the leg (Fig. 10), and these are not fully represented on the surface of the brain. But

they have been found by Horsley and Schäfer exactly in the place where, according to our idea, they ought to be, at the marginal convolution connecting the first and last centers of which we have just spoken and thus completing the circle of action.

Here I would like to draw your attention to the fact that great painters like great poets often appear to see more than ordinary mortals, and in his lovely picture, The Fall of Man, which is painted on the walls of the Loggia of the Vatican in Rome, Raphael seems to have almost forestalled the results of physiological experiment. In the mental picture of the scene which most of us must have formed for ourselves it is probable that it did not occur to many of us to pay any attention whatever to the movements of the great toe, and yet in Horsley's diagram of the cortical centers that for the hallux comes forward most prominently, and, as you will see from Raphael's picture (Fig. 15), Eve's foot is raised, and the great toe both in her foot and that of Adam is brought into what one would think rather too violent action. In the action of plucking and eating the fruit there is no break between the eyes, head, and arm, and that of the mouth and tongue, and in the usual process of eating the actions go on which are necessary simply to repeat the process of plucking and eating. Again, too, in the dog the arrangement is quite different (Fig. 11), and yet it is exactly what one would expect from the different necessities of the animal. In the frugivorous animal the motions are pluck and eat, pluck and eat; but in the carnivorous animal a long chase after the prey is necessary before the animal can bring the jaws into action, and in the dog accordingly we find that the movements of mastication, instead of being arranged in linear series with those of the limbs, are represented at a spot which is somewhat removed from them. In the cortex the centers are so far apart as to be distinguishable from one another; but as the nerve fibers which pass downward from them to the base of the brain become closely crowded together in the internal capsule, localization is more difficult (Fig. 12), although Horsley and Beevor have found generally that the arrangement of the fibers from before backward corresponds to the arrangement of the centers just described. But

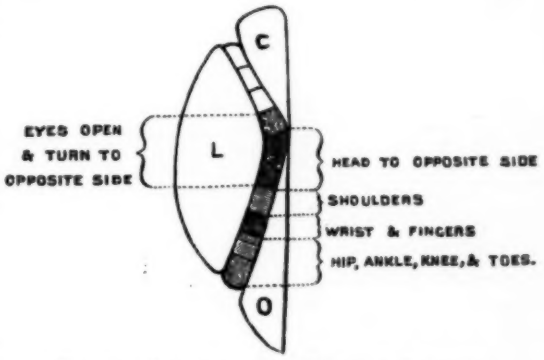

FIG. 12.—DIAGRAM OF THE INTERNAL CAPSULE.

as the nerves pass out from the spinal cord to reach the muscles they again become separated and, as Ferrier and Yeo have discovered, the motor roots which enter into the brachial plexus are arranged with a view to definite co-ordinated movements. Now, this plexus has been to me, and I think to many others, a perfect perplexity, both in its anatomy and physiology. Yet, if we take it from the same point of view as we have taken the motor centers, it becomes comparatively simple. We must not forget that, although the monkey is so much like man that we can draw most useful deductions regarding human physiology from experiments on these animals, we must not transfer without more ado the results of these experiments to man in their entirety. We must remember that man, although formerly a frugivorous and probably more or less arboreal animal, is now very different from a monkey, and experiments in the laboratory must be compared with and corrected by those experiments which disease makes upon man in producing localized palsies. I think it very probable that many here would find it difficult to answer the question, What are the movements which result in the monkey from stimulation of the fifth cervical nerve?—nor might he be able to remember them six months hence even if he learned to-night that they consist in the shoulder and arm being raised upward and backward, the humerus rotated outward, the forearm flexed and supinated, the wrist extended, and the tips of the fingers flexed. But he would find it easy enough to remember them, not for six months only, but for the rest of his life, if he were told that they were simply those required to raise the hand in such a way as to grasp an apple hanging

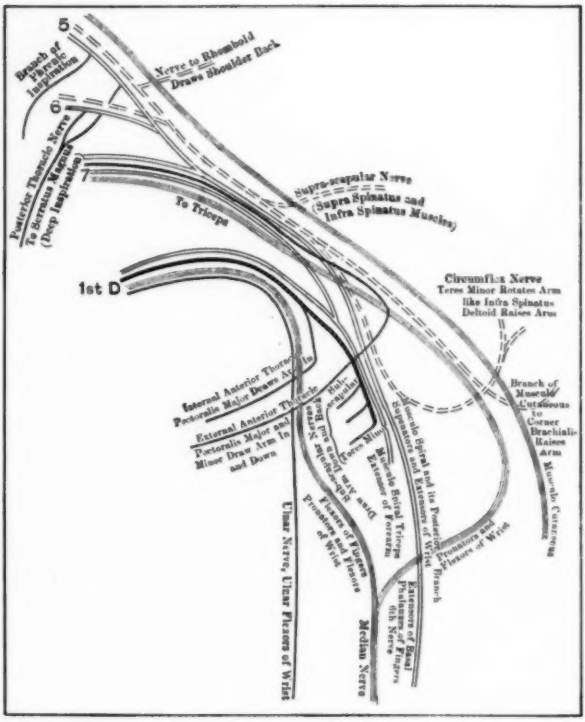
5
Branch of Phrenic Inspiration
Nerve to Rhomboid Draws Shoulder Back
6
Posterior Thoracic Nerve To Serratus Magnus (Deep Inspiration)
7
To Triceps
Supra-scapular Nerve (Supra Spinatus and Infra Spinatus Muscles)
1st D
Circumflex Nerve Teres Minor Rotates Arm like Infra Spinatus Deltoid Raises Arm
Branch of Musculo Cutaneous to Corner Brachialis Raises arm
Musculo Cutaneous
External Anterior Thoracic Pectoralis Major Draws Arm In
External Anterior Thoracic Pectoralis Major and Minor Draw Arm In and Down
Musculo Spiral Triceps Extensors and Extensors of Wrist
Musculo Spiral and its Posterior Interosseous Branch Supinators and Extensors of Wrist
Ulnar Nerve, Ulnar Flexors of Wrist
Median Nerve
Flexors and Pronators of Wrist
Flexors of Fingers
Extensors of Basal Phalanges of Fingers
Extensors of Wrist

FIG. 13.—DIAGRAM OF THE BRACHIAL PLEXUS.

straight above him. If you go through these movements you will find that your first impulse is to take a slight breath, which is chiefly effected by the diaphragm, and on looking at the brachial plexus you find that the first branch which is given off from the fifth nerve is a filament to the phrenic (Fig. 13). Then, just as you proceed to raise your shoulder, you take a still deeper breath, and this, too, is represented in the plexus by the posterior thoracic nerve, starting from the fifth and sixth nerves and going to the serratus magnus, which has little power to raise the ribs and act as an inspiratory muscle while the shoulder is depressed, but will

FIG. 14.—EXPULSION FROM PARADISE. (After Raphael.) The position of Eve's right hand shows the action of the seventh cervical nerve.

do so when the arm is raised. If your hand is hanging by your side, you will find the shoulder slightly drawn backward by the rhomboid and the arm rotated a little outward by the infraspinatus, which is supplied by the suprascapular nerve. Next, you raise your arm, and as you do so you will find that unconsciously you bend it and turn it out, you extend the wrist and flex the fingers. The raising of the arm and turning it out is effected by the deltoid and teres minor, which are innervated by the circumflex nerve, while the shoulder is still further raised by the trapezius, which gets its nervous supply from a higher source—the spinal accessory. The biceps and other flexors of the arm receive their supply through

the musculo-cutaneous nerve from the outer cord. In the movements of the wrist and fingers the fifth and sixth nerves appear to co-operate, and those of the fingers are chiefly due to the sixth. The supinators and extensors of the wrist, fingers, and thumb get their nerves from the musculo-spiral or its interosseous branch. To resume, the fifth and sixth cervical nerves raise the shoulder, flex the forearm, and extend the wrist. The nervous energy passes from them along the upper trunk and outer cord of the brachial plexus to the flexors of the forearm, while the impulses to raise the shoulder, rotate the humerus, and extend the wrist and fingers travel chiefly through the posterior cord by the musculo-spiral nerve and its interosseous branch to the extensors of the wrist and digits. From the fifth and sixth cervical nerves we make a jump to the first dorsal, which has an exactly opposite action. The movements it produces are that the hand closes firmly upon the apple, the wrist is twisted round into the prone position and flexed to the ulnar side. The forearm is extended, and the upper arm is retracted in the manner required to pull the apple from the tree. In these movements, if you put your hand upon your chest, you will find that the pectoral muscles are largely engaged, and they receive their nerves partly from the internal cord of the brachial plexus. Flexion to the ulnar side is produced by the ulnar nerve, and the dragging of the arm down is effected by the subscapular, teres major, and latissimus dorsi muscles, which are supplied by the subscapular nerves, and the triceps by which the arm is extended gets its nerve supply from the musculo-spiral. But these movements, especially if executed forcibly, as they would be if the apple were firmly attached, would bring the hand below the level of the mouth, and the prone position would keep the apple away.

We must now go back to the sixth cervical nerve, which we find will rectify this action, for it raises the arm inward and upward with the forearm flexed, so as to bring the hand to the mouth, supinated, and with the wrist and basal phalanges extended, so as to present the apple comfortably for eating. In effecting this movement the nervous impulses travel by the posterior thoracic, circumflex, musculo-cutaneous, musculo-spiral, and median nerves to the serratus magnus, deltoid, biceps, brachialis anticus, supinator longus, and extensors of the wrist and basal phalanges. The position of Adam's left hand in Raphael's picture shows this action in its middle stage, before it has carried the hand to the mouth. The few last phalanges of his fingers are flexed, and we may suppose that the flexion is effected by means of the median nerve, but it is just possible that their flexion may be due to mechanical pulling on the tendons by the extension of the wrist and basal phalanges just as the hand is opened in the well-known

schoolboy trick by bending the wrist forcibly inward, and thus mechanically stretching the extensor tendons of the fingers. In this picture the action of the serratus magnus muscle in drawing

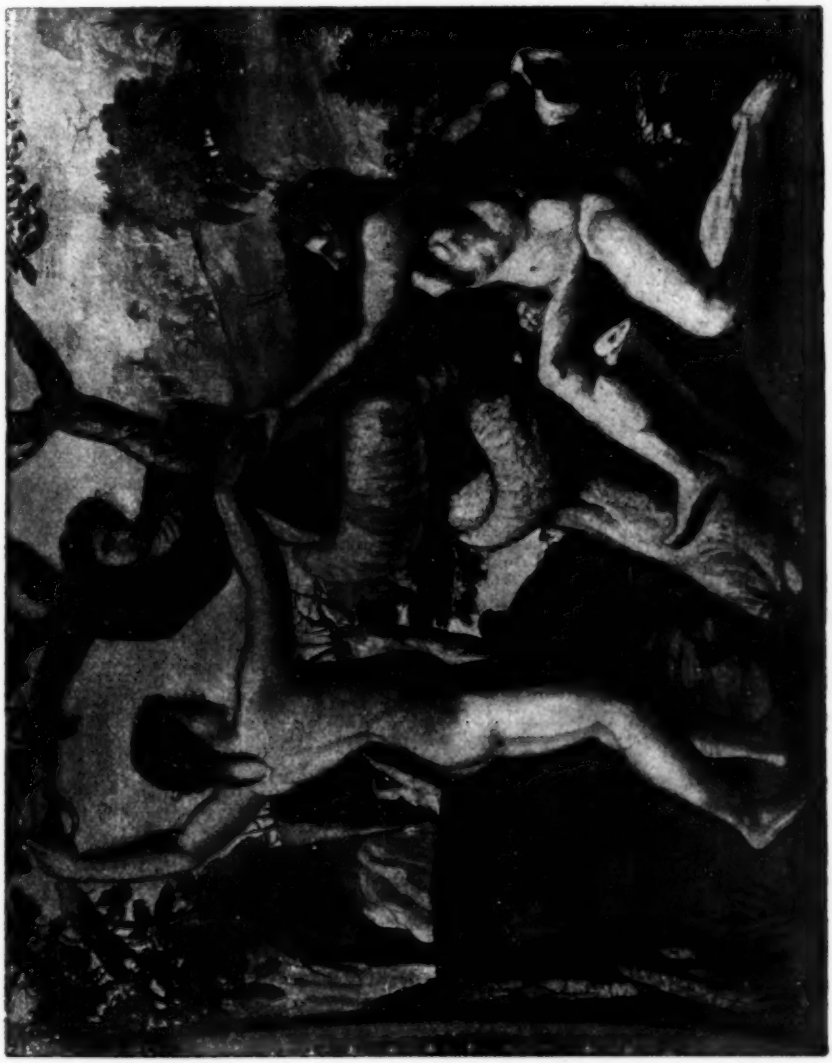

FIG. 15.—THE FALL OF MAN. (After Raphael's picture in the Loggia of the Vatican, Rome.) The position of Eve's left arm illustrates the action of the fifth cervical nerve, and that of her left hand the commencement of action of the first dorsal nerve. The position of Adam's left arm shows the action of the sixth cervical. The action of the hallux is well shown in Eve's right and Adam's left foot.

forward the shoulder and rotating the scapula so as to raise the shoulder is well seen, and the action of the muscle appears almost exaggerated. We have already found that it gets a branch from

the fifth nerve as well as from the sixth. We may fairly suppose that the branch from the fifth is the channel for the impulses which cause the muscles to act as an inspiratory muscle when raising the arm to pluck the apple, while that from the sixth serves to excite the muscle to pull the shoulder forward. Now, here we have got, apparently, the movements required for plucking the apple and conveying it to the mouth, and yet we have got two nerves which seem superfluous—the seventh and eighth cervical. We may suppose the seventh to be brought into play later on, when the first pair recognized their nakedness, for its action in the monkey is to bring the hand over the pubis in the position of Eve's, as represented by Raphael in the Expulsion from Paradise (Fig. 14). We can not in this scheme find a place for the eighth nerve in the entirety of its action, as observed in monkeys, but the first part of the movement which it produces may be used in throwing away the refuse of food.

The mere fact that I have been unable to work this last nerve properly into this scheme shows you how imperfect it is, yet I trust that, as an attempt to hang together the facts—anatomical and physiological—it may not be without service as an aid to your memories, and still more as an inducement to you to find out the true relationships of the different parts of the body.

PROF. G. F. WRIGHT AND HIS CRITICS.*

By Prof. E. W. CLAYPOLE, B. A., D. Sc. (Lond.), F. G. SS. L. E. and A., Akron, Ohio.

FOR more than twenty years a controversy on the antiquity of man has prevailed in the scientific world. This controversy is still far from decision. The origin of the human family is veiled in obscurity, and all efforts to discover our primeval ancestor have hitherto failed. The gloom and darkness enshrouding the past are not yet sufficiently dispelled by the light of science to reveal prehistoric man in his early stages.

The geologist and the archæologist have been chiefly engaged in the search. They have followed the trail of man to some distance and can tell us something about him within narrow limits. But beyond these their efforts have met with little success. At this point it seems as if some huge effacing hand had swept across the field and blotted out almost every trace of his existence.

And this is no mere imagination. A huge effacing hand *has*

* Man and the Glacial Period. By G. F. Wright. International Scientific Series. D. Appleton & Co.

swept across the field and wiped out the records written as with an iron pen on the rocks, and has engraven in their stead a palimpsest of its own. The Ice age is now a familiar topic, and its massive ice-sheet a reality to all. The continental glaciers which covered a great part of North America and Europe with ice thousands of feet thick, and enduring for thousands of years, literally swept from the face of the country the monuments of preceding life, leaving in their place its own memorials which the geologist is now learning to interpret.

Here is the unexpected barrier which meets the archæologist and the geologist in their investigations. They can follow the trail of man back into the Pleistocene era almost or quite to the edge of the ice. There it either becomes exceedingly faint or is lost altogether. In the tangled maze of glacial history the previous confusion is worse confounded, and the thin thread of evidence for man's existence is broken or lost.

The nature and date of the Glacial era and man's relation to it thus become important problems in the main issue, and it is these with which Prof. Wright's book deals. To some geologists the Ice age was single, to others it appears to have been double, triple, or even more complex. Some believe that man was contemporary with the later and even with the earlier stages of the era. Space will not allow us here to do more than mention these divergences of opinion, but so much was necessary in order to understand the scope of the work.

The appearance of Prof. Wright's little book has been the signal for a renewal of the controversy with fresh energy, not to say with acrimony, yet in it the ordinary reader would scarcely find any cause for commotion. It is for the most part merely a condensation of the same writer's larger work on the Ice Age in North America. Its aim is to lay before the general reader a short sketch of the present state of our knowledge of the Glacial era, and to briefly state the evidence bearing on man's existence during it or any part of it. The book is not sensational; it contains little or nothing that is new; it publishes no startling facts; it propounds no novel or strange theories, scientific or unscientific; it is simply, as it professes, a summary view over the field of glacial geology.

The author is well known to geologists by his share in the epoch-making work of tracing the southern limit of the ice-sheet across the North American continent. This was accomplished by him in connection with Lewis, Upham, Smock, Chamberlin, Cook, Leverett, etc., and, as far as the western Illinois State line, may now be considered definitely known. In this great work Prof. Wright may fairly claim a place among the first, having commenced his studies on the drift hills of Andover,

Mass., as early as 1876, when his first paper was read before the Boston Society of Natural History. Largely through him the late Prof. H. Carvill Lewis was brought into the work, and our author's studies on the Muir Glacier in Alaska gave us most of our early knowledge of a region previously almost a *terra incognita* to science.

Qualifications thus won by hard work in the field secure for the author, Prof. Wright, no mean place among glacial geologists, and entitle him to at least respectful attention. It is therefore somewhat surprising to note the storm of criticism and even abuse with which the work has been assailed by certain geologists.

Far be it from us to deprecate criticism, even if severe. Equally far is it from the desire of the author. But we feel justified in the name of science in entering a protest, and a strong one, against the style and manner of the articles which have appeared in condemnation of the work and in denunciation of the writer.

In thus protesting against so unusual and apparently concerted an attack we do not wish in any way to defend the author from so much criticism as is just and courteous. The book is far from perfect. We can not acquit the writer of apparent haste in its completion. Besides inaccurate expressions there are in some places insufficient statements of the divergences of opinion. Many of these have been already pointed out, and have received all the blame that is due, and in no measured terms. The title, for instance, should have run, The Glacial Era and Man, for of its ten chapters only one is closely connected with human history. It is scarcely correct to write of the great interlobate moraines as medial (page 100). We presume that our author means that their material was carried on the ice during its flow. This was in great part true, but they did not exist as medial moraines at any time, and were only formed at the melting end of the ice-sheet. Nor do we think that any evidence worth consideration can be adduced in support of the supposition of a great southern subsidence to explain the origin of the loess in the Mississippi Valley. We think that Prof. Wright should have recognized the fact that northern drift had been reported from Kentucky many years before his visit (page 212), and the expression "I have traced the limit of southern bowlders for thousands of miles across the country" is certainly unfortunate. It is, perhaps, literally true in the sense intended, but it is liable to misconstruction, and has been misconstrued. We might also object to his use of the word "preglacial." In this, however, he has many companions among geological writers.

We may further add that his explanation of the relation of the *névé* to the glacier has been assailed with justice, and is quite indefensible. There is, however, little occasion here to expose

the weak points of the volume, because this has already been done in a most excellent and exhaustive manner. The reviewers are certainly to be complimented on their acumen, and we trust that in a second edition Prof. Wright will take full advantage of the kindness of his lynx-eyed critics. We believe that he may comfort himself with the thought that the worst that could be said has been said concerning his little volume.

But while we admit that such faults as those above noted justify unfavorable criticism to the extent of the errors, we can not for a moment allow that they warrant the one-sided, persistent, and personal attacks that have been made on book and author. The style of several of these is, to say the least, extra-scientific. One of Prof. Wright's assailants has so far forgotten the amenities of debate and the consideration due to himself and his profession as to employ epithets which can only be correctly described as "Billingsgate." Not all, we are happy to say, or even the majority, have been so self-disrespectful. We will postpone this case for the present. Meanwhile we propose to dissect some of the other criticisms, which, being clothed in a more decent and reputable dress, may lawfully claim the right to appear in public.

Granting this freedom from indecent exposure of temper on the part of most of the hostile reviews, we yet can not acquit their authors of manifesting unnecessary severity and also of lacking that calm judicial spirit which alone can give value to a criticism. There is too little logic and too much passion manifested in their writing. We would remind such belligerents that contradiction is not logic, and that ridicule and contempt are not argument. To pooh-pooh an opponent's evidence may amuse the ignorant, but can not mislead the thoughtful. With these it is far more likely to recoil and hurt the cause in which it is employed. It is surprising and at the same time somewhat amusing to those outside of the fray to see weapons so unscientific employed in what professes to be a scientific discussion. To the public the onslaught made on Prof. Wright by chiefly official geologists savors too strongly of the old-time, intolerant, theological method of crushing a formidable rival by dint of concerted action or force in default of reason. This may be altogether an unwarranted inference; indeed, one can not readily admit even the supposition, but it is inevitable, and for it these writers alone are responsible.

Some of the critics have gone out of their way to make caustic remarks on the profession of the author. Surely they should be familiar enough with the records of Science to be aware that, in spite of all the obstacles which theology has thrown in her path, many theologians have risen superior to their environment, and to them geology is deeply indebted. Without the labors of

Buckland, Sedgwick and Woodward, Bonney, Blake, Crosskey, Fisher and Renard, Haughton and Hitchcock, many valuable chapters would be missing from her literature. Instead of regretting that a theological professor should be found in the geological field, it would be more seemly to wish that there were more such men. Instead of showing apparent jealousy, all helpers should be made welcome. Official reserve and exclusiveness are out of place in science. The field is the world, the harvest is plenteous, and the laborers are all too few.

Especially inappropriate is the above objection when it comes from men whose time is largely occupied with the labors of administrative office, leaving only the spare hours for the study of geology. We freely admit that men whose lives are wholly given to geology should produce the greatest results. They have advantages possessed by no others. Concentration of thought and energy, command of funds, access to books, and assistance of many needed kinds, all these things are theirs. But the fact remains that the great bulk of the work always has been and still is done by volunteers, working for the most part at their own expense of time and money. The amateur is too often looked down upon by the professional, but it has happened over and over again that the professional has been glad to borrow the results of the amateur, and more than once has the amateur come out the victor in a contest. It was an amateur, Nicol, who maintained that the gneissic rocks of the west of Scotland were of Archæan age and not metamorphosed Silurian strata, and, though for fifty years the authority of Murchison and the British Geological Survey was arrayed against him and his single voice was drowned by their official shoutings, yet time has justified him, and the "Secret of the Highlands," lately wrung from the unwilling rocks, has been proclaimed by Nature in tones so loud that no combination or concert could prevent its being heard. It is folly, we assert, to attempt by any other means than fair and open argument to put down the amateur in science. He possesses a tenacity of life and purpose equal or superior to that of officials or professionals. Many of the brightest names on her roll are the names of amateurs, from those of Hugh Miller, the Scottish stonemason, and William Smith, "the father of English geology," to others in the present day, too numerous and too well known to be named here.

The chapter of Prof. Wright's book which has specially aroused the ire of the critics is on Relics of Man in the Glacial Period, where the author has collected all the instances from America that possess any importance in which traces of man have been reported from strata of probable or known glacial date. The evidence of each is set forth concisely yet clearly. Positive con-

clusions are not drawn, and the reader is cautioned against hasty judgment. It is not easy to see how the scanty and fragmentary evidence connecting man with the Ice age could have been more fairly stated. Only six examples in all are given, and no case is brought forward in whose favor a considerable mass of evidence can not be quoted. None is new. They have been before the scientific world and the general public more or less for several years, and their evidence, *pro* and *con*, has been sifted and resifted, so that its value can now be fairly well estimated. And we are audacious enough to believe that there are men as competent to estimate it as any of the self-appointed judges who have taken on themselves to sit in judgment on the author. Yet more, our temerity goes so far as to lead us to prefer the calm and temperate conclusions of such men to the contemptuous and almost passionate utterances of others, learned and able we admit, but evidently carried away by a common impulse or (we say it reluctantly, but the facts irresistibly suggest it) acting under instructions which they can not resist. Their zeal has outrun their discretion.

Coming down to details, we note that the critics are not always agreed among themselves. One of them, a distinguished archæologist,* admitting that "as a glacialist the author stands among the first in the country," goes on to assert that the well-known gravels at Trenton, N. J., where Dr. Abbott has been for years finding very rude argillite implements, are of doubtful date and "require more study before we can assign their probable age." But an equally distinguished geologist, "the head of the glacial division of the United States Survey," says "the Trenton gravel is strictly contemporaneous with the Belvidere moraine," thus making it coeval with the greatest extension of the ice. Not even Dr. Abbott himself has claimed a greater age for the gravels and their contained implements than this; and Prof. Wright is yet more moderate in his estimates, assigning them to the later or even to the last stages of the era of ice. Until, therefore, it is definitely proved that all the investigators are mistaken who believe that they have really taken these implements from undisturbed strata, we think our author is justified in his conclusions.

If it would not be too presumptuous in an outsider, we would remind the distinguished archæologist that the whole problem is not contained in the position of the tools. Other elements are concerned, and it is not logical to insinuate a doubt concerning one line of argument and to remain silent on all the rest, or to quote his own negative experience against positive testimony.

It would be tedious to dwell on the details of similar finds in

* Science, October 28, 1892.

Ohio and Indiana. The utter rejection and slighting of testimony because it does not come from experts is, in our humble judgment, a serious blunder. It is easy, by the assumption of superior knowledge and "later information," to discredit able, honest, and competent work by men who are termed, not with respect, "amateurs." We have already shown what science owes to amateurs. Let us take the further liberty—and we do so with the profoundest respect for the distinguished professionals concerned—of reminding them of the experience of their European brethren in a similar case. Fifty years have gone by since M. Boucher de Perthes found in the gravel near Amiens implements of human manufacture. His discoveries were published and received by the scientific world with complacent contempt and neglect, not to say opposition. "The gravels were modern," "the beds had been disturbed," "the implements had been recently inserted," "the whole story was fictitious," * and its author a "cheat," a "shyster," and a "charlatan," as nearly as French politeness could match these terms. But time rolled on, the evidence could not be shaken by neglect and contradiction; and when at last a committee was sent to the spot they returned unanimously convinced that the amateur was right, and that all the previously held theories of geologists on the antiquity of man must be reconstructed through the finding of these rude implements by M. Boucher de Perthes. History repeats itself, and we respectfully urge on Prof. Wright's critics the careful study of the little incident above quoted, and especially the momentous moral which it implies and which we leave them to draw.

The caution of our author is shown in his discussion on the most doubtful case, that from Claymont, Delaware, where an implement was reported by Mr. Cresson from the Philadelphia gravel underlying the Trenton gravel, and consequently of greater age. We need not remind our readers that the evidence demanded in support of every discovery of human relics increases rapidly with the implied distance of their date. This is just, and the language employed concerning the Claymont tool could scarcely have been more guarded. Prof. Wright says (page 258), "As there is so much chance for error and so little opportunity to verify the conclusion, we may well wait before building a theory upon it." His opponents could hardly desire more caution.

We may, however, linger awhile over the next instance—the well-known relics from Table Mountain, California. These were first announced by Prof. Whitney, in his report on the geological survey of that State, and others have since come to light. We can not here give details, but must content ourselves with saying

* See American Anthropologist, January, 1893.

that they were found in the auriferous gravel underlying a sheet of lava which flowed over them and has since been glaciated and cut through by the stream. Naturally, the occurrence of human relics, and relics of so late a type as were these, was not easily accepted by archæologists or geologists. Probability and prejudice were both on the other side. But both must yield before sufficient evidence; and we make bold to say that, in the face of the testimony now accumulated, skepticism is no longer reasonable. The objection raised against the discovery is unworthy of the able archæologist * from whom it comes. "They belong to a modern industry, and were probably left in their shafts by the aboriginal gold-diggers a few centuries before the conquest. The manner of their deposition alone proves this, and the case is given up by Prof. Haynes in his appendix to Prof. Wright's book."

We do not wish to be discourteous, but justice impels us to ask if this distinguished archæologist really expects the public, or the scientist accustomed to the weighing of evidence, to accept the insinuation of one who was not near the spot in preference to the sworn statement of one who was there, and testifies that he took the relics with his own hands out of the gravel, and that there was no disturbance (such as an aboriginal shaft) or natural fissure by which access could be obtained either there or in the neighborhood. Verily, to us this seems like "criticism run mad."

As to competency in a matter of this kind, we will hear Mr. G. F. Becker, in the Bulletin of the Geological Society of America, 1891, page 192:

"It has sometimes been objected to the authenticity of implements in the gravels that the finders, with the exception of Dr. H. H. Boyce, were miners and not scientific men. Now, so far as the detection of a fraud is concerned, a good miner, regularly employed in superintending the workings, would be much more competent than the ordinary geological visitor. The superintendent sees, day by day, every foot of new ground exposed, and it is his business to become thoroughly acquainted with its character; while he is familiar with every device for 'salting' a claim. The geological visitor finds a mine timbered and smoked. He can not fully acquaint himself with the ground, and is usually unfamiliar with tricks. It is therefore an argument in favor of the authenticity of implements that they have been found by miners. . . . There is, in my opinion, no escape from the conclusion that the implements actually occurred near the bottom of the gravels, and that they were deposited where they were found at the same time as the adjoining pebbles and matrix."

In reference to the above-quoted opinion of Prof. Haynes we

* Science, October 28, 1892.

must take the liberty of saying that it is logically irrelevant. Prof. Haynes is only discussing the "find" in its relation to Tertiary man, which is a totally different topic. The fallacy underlying most of the objections to the Californian relics is the tacit assumption that the glaciation of the lava beds was contemporaneous with that of the Northern States. This is unproved, and probably untrue. Its rejection may remove the chief difficulty.

Once more we must return to the charge. We regret to be obliged to criticise the same critic for another example of illogical reasoning, but, in view of the severity of the attack on Prof. Wright, we feel that the assailants should not and will not object to the counter-thrust.

The story of the Nampa image is now well known. It was told by Prof. Wright, in 1890 and 1891, to the Boston Society of Natural History, and by them published in their Proceedings. The image is a small figure of burnt clay, about one inch and a half long, which is said to have been brought up by the sand-pump from the surface of an old soil at the depth of three hundred and twenty feet below a sheet of lava fifteen feet thick. The "find" was not hastily and superficially examined. A long and careful inquiry and a visit were the means of eliciting the details, and collateral investigation was made into the reputation and antecedents of the informants. All this has been before the world for many months, but no refutation or rebutting testimony has been offered. Yet the following extract will show how contemptuously the investigation is tossed aside:

"Dr. Wright's last example is the feeblest of all—the Nampa image.* . . . It is sad to destroy illusions, but when this same image, with its story, was laid before a well-known government geologist, he at once recognized it as a clay toy manufactured by the neighboring Pocatello Indians, and the person displaying it replied, with engaging frankness, 'Well, now, don't give me away.'" †

Mark in this connection the fact that not a fragment of counter-evidence is brought. There is nothing, absolutely nothing, to shake the previous testimony. An anonymous letter could hardly be used in a court of law, yet here is not even so much as that. Merely an anonymous statement is brought forward solemnly by one who is supposed to be accustomed to serious investigation as a rebuttal of written and repeated testimony from men of stand-

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* Science, October 28, 1892.

† Another version of this story is given by a second critic (see American Anthropologist, January, 1893), who reports the reply as follows: "Don't give me away; I've fooled a lot of fellows already, and I'd like to fool some more." The difference is not important, but it emphasizes the denial given below.

ing and reputation. It is not easy to believe that such a logical fallacy could come from such a source. The *ipse dixit* of a man in the position of this critic might be entitled to respect, but we have not even that. He can scarcely expect scientists accustomed, as the author, to look for arguments to accept this bald statement. It is difficult to treat it seriously. *Risum teneatis, amici?* Let him get from the "well-known government geologist," here and thus referred to, a full, exact, and certified statement of the conversation over his own signature, giving all details as he recalls them, what he said, where, when, and to whom; with what was said to him in reply and by whom, and the criticism will then be worth consideration. But, as it now stands, it is weaker and feebler than the weakest and feeblest of the cases which Prof. Wright has brought forward.

Of course, we can only guess who this well-known government geologist can be, but if circumstances indicate correctly it will, in our opinion, be long before any statement such as that above desired will be obtained from him to confirm this illogical objection to our author's express assertion. We will further say that the owner of the image positively and emphatically denies in writing having ever himself made the remark above anonymously quoted, and volunteers the further statement that he knows nothing whatever of the whole alleged occurrence.

Such insinuations, unaccompanied with evidence and intended to undermine confidence in the results of years of persistent work, are really beneath notice, save to expose their utter logical baselessness and the animus whose shadow is visible beneath and around them. Let us turn to some criticisms of a different kind.

There is another tone sometimes adopted, less undignified perhaps, but not less inappropriate and offensive, especially in a supposed scientific discussion. It may be called the "omniscient" style. It sounds as if coming from some lofty height wherefrom the writer can discern all the details of a struggle in which the unfortunate actor below is bearing an insignificant part. This style is a danger especially besetting men in official positions. The infallibility of office is well known and sometimes amusing. "No mistakes allowed." It is a form of apostolical succession not unknown in the realm of science. The mantle of Elijah is supposed to rest on Elisha, whether it fits or not. To those official geologists who so far forget themselves as to assume the air of superior knowledge, especially to the younger ones, we respectfully commend the wise and witty saying of Whewell, the great Master of Trinity, at Cambridge: "Be not too positive; we are all fallible, even the youngest."

Some of the remarks on Prof. Wright's book suggest the mental attitude above described. A positive statement is made on a

moot point in science. Thus we read,* "It is demonstrated that the Ice age was prolonged and complex." Perhaps it was so. We express no opinion. But the distinguished glacialist who wrote it is well aware that not a few among his brother-geologists—men of experience, ability, and reputation perhaps equal to his own—totally disagree with him here, and believe that the evidence does not warrant so great an extension of the era. No doubt the question is settled in the mind of the writer and to his entire satisfaction, but he is guilty of misleading the public by thus baldly stating the proposition. Thus printed, it implies either that no one differs from him, or that those who do so differ are unworthy of mention or consideration. Logically, it is begging the question, for the whole controversy hinges on this point. It is more than this, it is committing the very error which he has charged on Prof. Wright. He says,† "Instead of pointing out clearly and fairly differences of opinion on vital points, Prof. Wright turns aside," etc. We can not find in the volume any assertion that the Ice age was a unit, though this is the view entertained by its author. On the contrary, fourteen pages are filled with the arguments on both sides, enabling a reader to form his own opinion. It is fair to expect the critic to shun the fault which he condemns. Yet here he has himself committed it.

Again, our distinguished critic boldly asserts,‡ "No geological expert of unquestioned competence has ever yet, so far as we can learn, found a single implement or stone flaked by man in a glacial formation in America which was clearly deposited contemporaneously with it." Possibly so. We here express no opinion on this or on any other moot point. But we may ask, By what right does he set himself up as a judge of the competence of all other workers who think that they *have* found such stones? Who, in his opinion, are experts? Where shall such men be found, and by what touchstone shall they be tried? Is official connection the grand *sine qua non?* The outsider is almost driven to this conclusion by the tone of the criticism. Are there no other men as competent as he who are of a different opinion? Is the mature judgment of long-standing workers who have earned by time and labor a right to speak to be waived aside in favor of the opinion of some single expert? And who shall testify to this expert's expertness? It would be ungenerous to assume that a little band of scientists seriously desire to extol themselves and each other by attempting to "sit down" on every one outside. Yet let us assure them that this is the conclusion to which their language leads. The air of dogmatic assumption and superiority that per-

* Dial, Chicago, November 16, 1892, p. 306. † Ibid. ‡ Ibid., p. 304.

vades many of the criticisms of Prof. Wright's book is dangerous to the freedom of scientific discussion.

In an unsigned review published in an issue of the Chicago Tribune in October, 1892, we read: "Prof. Wright believes that there was but one Ice epoch. In the present volume this question is so handled as to leave the impression that the general opinion of glacialists is in favor of but a single epoch." How true this charge is let the following extract show (page 109): "Do the phenomena necessarily indicate absolutely distinct Glacial epochs separated by a period in which the ice had wholly disappeared from the glaciated areas to the north? That they do is maintained by President Chamberlin and many others who have wide acquaintance with the facts. That they do not certainly indicate a complete disappearance of the ice during an extensive interglacial era is capable, however, of being maintained without forfeiting one's rights to the respect of his fellow-geologists." The criticism is anonymous, and we are thereby spared the disagreeable association of any name with a direct misrepresentation, due, let us hope, either to careless reading or previous writing.

To one of these two causes we should also probably assign the remark, "Mr. Leverett's work is ignored,"* whereas Prof. Wright quotes Mr. Leverett's work as correcting that of President Chamberlin in the delineation of the terminal moraine south of Lake Michigan (page 101).

Another of these experts † writes in the same omniscient style about the "unskilled observers whose difficulty is to distinguish between objects included in the ancient gravel when it was formed and those imbedded recently. . . . Neither of the four are geologists (*sic*), and they could not well have appreciated the need of extreme care." Any reader of the evidence can form his own opinion upon this assertion. Again, "Four of the rude specimens said by inexpert observers to have been found in place in glacial gravels," etc.; and again, "The unsafe matter furnished by inconsiderate bookmakers to a credulous public." This sort of writing would in ordinary mortals be called conceited and unbecoming, but probably from the pens of the self-appointed experts it is perfectly proper toward the amateur and the public. However, let it pass; there is more to come.

As if this were not enough, we read in the same place the following yet more unscientific statement: "The implement from Tuscarawas County, Ohio, can be duplicated from the refuse deposits of any of the great Indian quarry-shops of this country." This is an extraordinary assertion, surpassing in audacity any

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* Dial, Chicago, November 16, 1892, p. 306.

† American Antiquarian, January, 1893, pp. 35, 36.

previously quoted. We are familiar with the Newcomerstown flint, and can challenge the production of any reject from the neolithic refuse-heaps, or indeed of any fac-simile that could mislead a real expert on either continent. We are giving no opinion here on its nature or on its relation to the gravels in which it is found. We simply protest against the assumption by any one of the right to deny the competence of the oldest and most careful observers in favor of his own innuendo and without a tittle of evidence. It is idle to tell us that "gravels reset," * that "flints may be introduced after deposition," that "stones may be broken by Nature so as to simulate the work of man," etc. All this we know, but we ask the reason for suspecting that these things have happened here and without detection. Without this the objections are mere insinuations from men who will not admit that others know more than themselves; effusions of the "omniscients" in the garb of "agnostics," if we may be pardoned for borrowing the style of the Emerald Isle.

We scarcely agree with some of the critics that it is unadvisable to take the public into confidence until final and positive results are obtained. This, again, savors too much of officialism. The reading part of the public is interested in the work of discovery not less than in the outcome, and is able and willing to watch its process. Prof. Wright was advised against publication by the "head of the glacial division," on the ground of the immaturity † of the investigation and the liability to teaching the public erroneous views. The ready sale of The Ice Age in North America, now in its third edition, is a proof that the public was ready and the time ripe, and few who have read it with ordinary care can fail to grasp the real condition of the problem. We think that any reader who deduces final and positive conclusions from the book has read it to little purpose. Suspense of judgment is not a state of mind congenial to the untrained or always found in the trained, but this must be the mental attitude of any reader of the work in regard to the great problem of which it treats. Anxious regard for the public is entirely supererogatory.

Moreover, if justification for such publication of incomplete work were required, it may readily be found in the example of the "head of the glacial division" himself, who very soon after his appointment published in the Second Annual Report a map of the terminal moraine of the second Glacial epoch. How incomplete this was may easily be seen by any one who will take the trouble to compare it with the latest work in the same field. Moraine after moraine has been added outside the terminal moraine,

* American Antiquarian, January, 1893, p. 35.

† Dial, January 1, 1893, p. 8.

chiefly by the labors of Mr. Leverett, until the terminal moraine now almost coincides, in Ohio at least, with the southern margin of the drift area.

Far be it from us to impute unworthy motives to any one of these critics. We would, if we could, believe that they are all impelled solely by a love of truth and a regard for the public good. But we regret that they have not made this less questionable. Criticism of a former colleague in terms so unsparing is sure, whether justly or unjustly, to be interpreted according to its obvious spirit. We unwillingly think of words so ugly as "jealousy," "conspiracy," "concerted attack," etc., but we warn these critics that they will hear them if they have not already come to their ears. They may fancy that they are the sole proprietors of the field, but there are men of science in the land whose voices will be heard in loud and earnest protest, and whose voices when heard will carry weight with their brethren and with the public. American geologists will not be silenced by official insolence or warned off their fields of investigation by "notices of trespass" from self-appointed owners. The whole tone of the discussion on one side is far from honorable to science, and will not redound to the credit of American geology.

We have said enough. We will not touch on that part of the controversy springing out of the author's connection with the United States Geological Survey. It may be right to estimate a man's work by the number of days for which he was paid.* This is probably the official method of reckoning, but we will remind the critic who dwells on this point that amateurs are in the habit of spending time and money very freely without hope of recompense and, indeed, without keeping any record. Probably this fact lies at the bottom of the discrepancy on which so much stress has been laid.

There is one article which demands a few special words. It comes from the pen of a much younger man than Prof. Wright, and allowance should perhaps be made on this ground. We observe that in his reply the professor seems to be conscious of this, and to have restrained his pen. But, after granting so much, we can not acquit this gentleman of forgetting the courtesy due to an older man and an older geologist than himself. Energy of expression may be forgiven in the heat of argument, especially if it arises from strength of conviction. Even authoritative and dictatorial assertion without condescending to give reasons, however illogical, is not unpardonable in an opponent. Hard blows received in fair fight may leave scars, but their memory does not rankle; and hard words hastily spoken, though not pleasant,

* Dial, January 1, 1893, p. 7.

seldom leave a lasting sore on the mind of a generous foe. Any such is usually healed by the ready and full apology which quickly follows.

But a combatant who stoops to employ weapons which his opponent disdains to use, places himself thereby outside of the pale of honorable warfare; and the controversialist who descends to the use of unparliamentary language in debate is self-excluded from further participation.

It is with regret that we write this, but it is due to all who cherish the honor of their science and the credit of American geologists to enter an earnest and serious protest against the adoption of a tone so bitter and language so unusual as those which characterize the article above referred to. We are unable to fully fathom the motives which led the writer to transgress so far the limits of judicial calmness and social courtesy, and we believe that his own manly feeling will sooner or later awaken and provoke his regret. Meanwhile the only result will be to arouse sympathy with the author, whose calm, dispassionate, and logical replies place the theologian-geologist on a marked vantage-ground above his professional but younger and overzealous brother. We regret that the American Anthropologist* has stooped to allow its pages to be disfigured with words which in no conceivable circumstances can be applicable by one scientist to another, or used by one in reference to another. It is difficult, without speaking too strongly, to characterize fitly so flagrant a breach of the unwritten code.

This critic has, of course, a perfect right to find fault, if he so desires, with any part or parts of the author's work. This he sees fit to do in regard to his measurements of the motion of the Muir Glacier. But he has done so in terms unnecessarily offensive and contemptuous. He contrasts the "blundering attempts" of Wright with the "excellent measurements" of Reid. The former gave seventy and the latter seven feet a day.† The difference is of course great and surprising; but the dogmatism of our young geologist is not very well timed, for admittedly the two measurements do not relate to the same part of the glacier. Moreover, we may be permitted to hazard the inoffensive remark on the other side that, after all, Prof. Wright's figures are more in harmony with some other known facts than are the smaller ones. We must presume that this critic is aware, though he has apparently for the moment forgotten, that, though the Alpine glaciers move at only a few feet daily in August, yet those of the arctic lands have a much more rapid rate. Thus the gigantic glacier of Jakobshavn, in Disco Bay, two and a half miles wide, has a move-

* American Anthropologist, January, 1893.

† Ibid., p. 89.

ment of fifty feet per day in the middle. The glacier of Karajak, four miles across, moves at thirty feet daily, while one at Upernavik travels at ninety-nine feet every twenty-four hours. Combining all these statements we recommend waiting before criticising.

The severe and caustic animadversions above criticised certainly show on the part of the critic a courage almost amounting to recklessness, but he has not always tempered his zeal with truth. In his anxiety to discover "unhistoric statements," as Prof. Huxley once called them, in Prof. Wright's book, he has not been sufficiently careful that his "finds" were in undisturbed strata, that they did not come from a talus, or had not been inserted at a later date. But what shall we say if they prove to have been inserted by himself for subsequent exhumation, Cardiff-giant fashion? Let us read what he says in the review here under consideration (page 92): "Prof. Wright conveys the implication that the Claymont argillite indicates the existence of early glacial or preglacial man, and that the Calaveras skull and the Nampa image in like manner indicate preglacial or Tertiary man, the implication being, however, deceptively guarded by indefinite expressions and meaningless cross-references."

We have already quoted (page 770) Prof. Wright's language regarding the Claymont tool, and will only express our surprise that any one possessing our critic's command of the English language could extract from it the above meaning.

As to the other two instances, we will trespass on our reader's patience by giving here also Prof. Wright's own words (page 299): "I can only say that the amount of erosion since the lava eruption of western Idaho is not excessive, and very likely may be brought within ten or twenty thousand years." And in regard to the Calaveras lava he writes (page 230), "The question of absolute time can not be considered separately without much further study." Then, following a suggestion of Prof. Prestwich, adopted by Mr. Becker, he infers, "not that man is so extremely ancient in California, but that many of these plants and animals have continued to a more recent date than has ordinarily been supposed."

Consideration of the above extracts on both sides renders it incomprehensible how Prof. Wright's language can be interpreted to imply a belief in *pre*glacial or Tertiary man. The whole tenor of his book is opposed to this belief, and those geologists who are familiar with the long rows of figures whereby this very critic is accustomed to express his date for the Ice age and the yet longer array which gives the date assigned by him to the *pre*glacial or Tertiary period, will be amused at his nervous apprehension here expressed about ten or twenty thousand years.

The zeal of the proselyte is proverbial, and the readiness with which he forgets his former faith. But this gentleman will excuse

us for reminding him (memory is sometimes inconvenient) of his own words in 1888. His own views of palæolithic man were then as unsound as, according to him, are those of Prof. Wright to-day. In this very magazine he wrote,* "Among the most recent and satisfactory archæologic discoveries of this country are those of two chipped implements of black flint found in Ohio by Dr. Metz at Madisonville and Loveland, in deposits of loess and aqueo-glacial gravel which G. F. Wright has shown to represent a closing episode of the later Glacial epoch." Again, "Excluding all doubtful cases, there remains a fairly consistent body of testimony indicating the existence of a human population in North America during the later Ice epoch."

Much more might be quoted, but we will spare the feelings of our critic. It is not fair to taunt a man with change of mind. Every scientist should be open to conviction and therefore subject to change. But we do look for a more tolerant spirit from one who has so recently seen fit to change his own faith on an important subject. He has been converted from the error of his ways, and now looks down on his benighted brethren, not with pity, but with feigned contempt. We would fain know the causes of his conversion, but forbear to speculate, and will rather believe that his logical mind has yielded to arguments which he could not resist and which bade him destroy a faith which once he preached. Possibly the evidence derived from the new science of *Gee*-omorphy has been largely instrumental in working this transformation.

We will not repeat what we have already said about the divergent views on the nature of the Ice age, further than to remark for the benefit of this critic that Whewell's wise saw above quoted may be recalled with advantage here.

Nor will we further follow this extraordinary effusion. Most of its charges have been made by others in less offensive terms and already noticed in this paper. Suffice it to say that we find it hard to comprehend how a scientist could allow his better judgment to be so far entirely overridden. No surer indication of a bad case can be given than "calling names," and next time he enters the arena we advise our indignant champion to submit to the careful search of some calm and judicious friend who will see to it that he carries into the field no unknightly weapons concealed about his person—in other words, that he request a friend to aid him in confining his exuberance of language within due bounds by the expurgation of such idiosyncratic terms as "egotistical," "incompetent," "shyster," "dupe," "knave," "harpy," "betinseled charlatan," with others of a similar nature which are not usually found in the current vocabulary of his scientific co-workers.

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* Popular Science Monthly, January, 1888.

One word in conclusion. We wish to make it distinctly understood that we here give no opinion on any of the subjects in dispute. Our purpose is twofold: first, to show the illogical positions in which several of the critics of the work have placed themselves; and, secondly, to expose the spirit which characterizes the reviews. Quoting from the American Geologist for February: "We at present content ourselves with a protest against the tone adopted by some of the critics and the air of assumption and of superiority which pervades their remarks. Both are eminently unbecoming to scientific literature and derogatory to the dignity of science. We may add that they are in striking contrast to the moderation and dignity of the replies.

"It is somewhat difficult . . . to discover the motive which has led to so violent an attack on a work which, after all, merely summarizes with caution the evidence as it stands and draws a qualified conclusion from it. Strange indeed is it to see the theologian in the van of the evolutionary army, with the geologist and the archæologist lingering in the rear."

THE MAORIS OF NEW ZEALAND.

By EDWARD TREGEAR.

MR. TREGEAR has furnished, in the shape of categorical answers to the code of questions sent out by Mr. J. G. Frazer, of the Council of the Anthropological Institute, a mass of information respecting those most interesting of savages, the Maoris of New Zealand. Culling out the more important statements and giving them current form, we obtain a picture of a race which has played an important part in the past history of the region they dwell in, and whose presence is in all probability destined to leave a permanent impression in the life of the colony in which they are being merged.

The Maoris are divided into tribes, which, coming from a common ancestry, are somewhat of a clannish character, and subtribes; a few of the names of which are derived from animals and objects. No sanctity is attached to the animal or plant from which the tribal name is derived, nor is there any superstition about killing or eating it. The tribes are not distinguished by differences of dress or mode of wearing the hair.

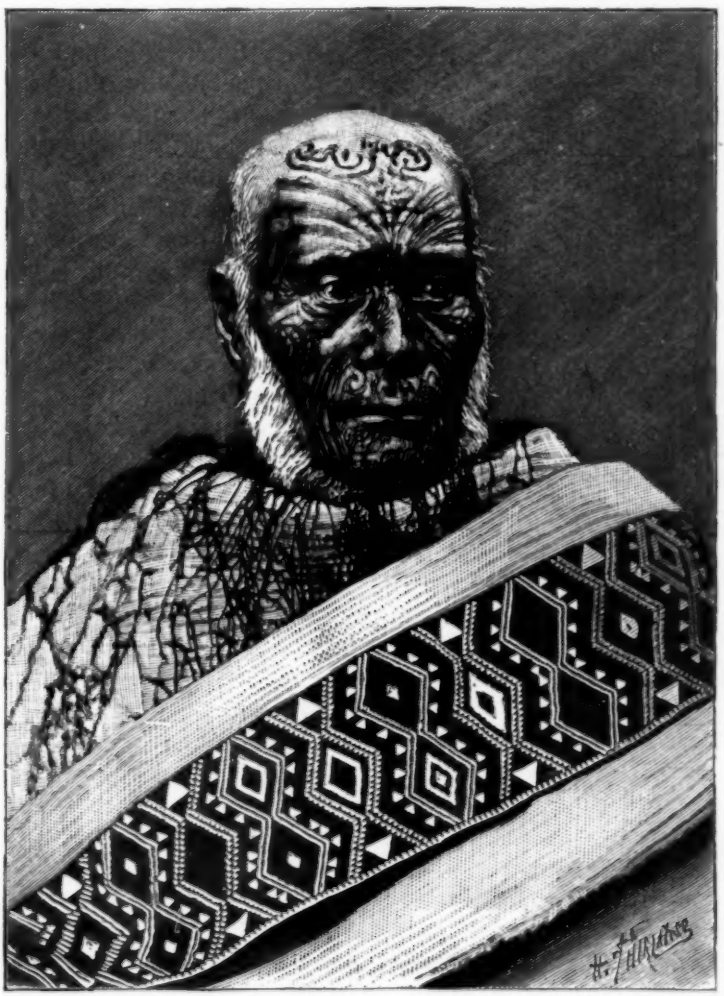
While particular ceremonies on the birth of a child are not common, certain priestly forms and incantations are observed in difficult cases occurring in notable families, during one of which, when it is performed, the father has to plunge into the river. The mother is *tapu* after confinement till the ceremonies

of purification are performed, of which there are two forms. In one form two fires are kindled—"new fires," made by the friction of wood—one for the gods and one for the priest-chieftainess. Fern root is cooked over the fire for the gods, waved over the child by the priest, and afterward placed in some sacred spot. If the female tribe-priest is present, she waves the fern root cooked on her fire, touches the baby in several places, and, pretending to eat the fern root without doing it, also puts it away. If she is not present, a lay figure is made of weeds to represent her. In the other form a number of clay balls, representing as many ancestral chiefs, are made by the priest, and little mounds, each named after a god, near them. The priest takes a branch, parts it, binds half round the baby's waist, chants his invocation; then sprinkles mother and infant by means of a branch, and chants again. When the song is finished he plants the branch, and if it grows the child will be a warrior. Then three ovens are made, one for the mother, one for the priest, and one for the gods, and food is cooked on them. A number of pieces of pumice are placed in a row and named for the child's ancestors. The priests offer food from the gods' oven to each stone in turn, of which they are invited to eat ("the soul" of the food), and with this the *tapu* is removed. Infanticide is not practiced, because there is room for all, and the tribes want boys for warriors and girls to be mothers.

At puberty the eldest son of a head chief is initiated into the secrets of priestcraft and witchcraft, with ceremonies that begin with a feast in which the people are not allowed to eat from dawn till dark. A shed is built, exclusively by chiefs, of palm branches, the number of sticks on each side of which must be equal, in which the old *Ariki* sleeps the first night. The young man is sent to him at dawn—naked, for fear his clothes may bring defilement. He is urged to sleep, while the priest watches for omens of jerkings. If an arm or leg jerks inward, it indicates luck; but if it jerk outward, the lad can not be taught. The incantations are repeated and the secrets are taught. The legends say that in the old land whence the Maoris came there was a college in which the young men were taught astronomy, agriculture, etc. A young chief's instruction was considered successful if he was able to strike a slave dead by repeating a charm. This statement may be disbelieved, the author remarks, "but *tapu* is an awful weapon. I have seen a strong young man die the same day he was *tapued;* the victims die under it as though their strength ran out as water."

Tattooing is practiced by all—the full tattooing of a brave taking place after he has distinguished himself in war. It is performed to the accompaniment of tattoo songs, and involves *tapus.* The person undergoing the process is prohibited from eating fish,

unless the fish is held up to see the tattooing. No gourd or calabash must be eaten from if children have playfully made tattooing marks upon it. The priest and all the people are *tapu* on account of the blood during the operation, but the ceremony of making ovens is gone through, much as in the purification rites;



TATTOOED MAORI CHIEF.

and the *tapu* is transferred to the gods' food by the priest handling one of the hot stones of their oven.

Girls were given great license from a very early age in the matter of lovers. Some girls, however, were born proud, and either kept to one sweetheart or had none, but this was rare. When a girl married she became *tapu* to her husband. Any one

outside the relation of brother and sister could marry, although marriage of first cousins was greatly disliked. Polygamy prevailed among those who could afford it, and whose circumstances or inclination led into it, "but as the tribe supported all in food, the mean men would be prevented, in some way or another, from having large establishments." Betrothal of children was common among people of high birth. "If no betrothal, there was generally a lot of talk and squabbling, every one in the tribe thinking he had a right to interfere, till at last the young couple, if lovers, would flee to the bush until their living together was agreed to. The girl generally began the courting. I have often seen the pretty little love letter fall at the feet of a lover—it was a little bit of flax made into a half knot; 'yes' was made by pulling the knot tight, 'no' by leaving the 'matrimonial noose' alone. . . . Sometimes in the *whare matoro* (the wooing-house), a building in which the young of both sexes assembled for play, songs, dances, etc., there would be at stated times a meeting; when the fires burned low, a girl would stand up in the dark and say, 'I love So-and-so—I want him for my husband.' If he coughed (sign of assent) or said 'yes,' it was well; if only dead silence, she covered her head with her robe and was ashamed. This was not often, as she generally had managed to ascertain (either by her own inquiry or by sending a girl friend) if the proposal was acceptable. On the other hand, sometimes a mother would attend, and say, 'I want So-and-so for my son.' If not acceptable, there was generally mocking, and she was told to let the young people have their house (the wooing-house) to themselves. Sometimes, if the unbetrothed pair had not secured the consent of the parents, a late suitor would appear upon the scene, and the poor girl got almost hauled to death between them all. . . . Girls have been injured for life in these disputes, or even murdered by the losing party. There was generally a show of force, more or less severe; but after she had been taken away, the parents came to see the pair, and when

MAORI WOMAN.

presents had been interchanged all were satisfied." It was sometimes the custom for a man who had many wives to lend one of them to a guest whom he wished to honor greatly.

Disease was supposed to be caused by the entry of an evil spirit into the body or by the anger of some deity or demon. Curses were sought through exorcisms, etc., by the priest; while for certain affections special methods of medical treatment were used, apparently with considerable success. Wounds were generally left to themselves, after broken pieces of spear or bone had been extracted; and they healed in a manner that a European could hardly credit.

To avoid having the home *tapued* by death, chiefs when dying were carried into some shed. At the sound of the wail from the wives and relatives, friends gathered and cut themselves with sharp shells and pieces of flint—women in the face, and men on one side of the neck. The hair was cut off on one side, while a few long locks were sometimes left untouched as a memorial of the departed. The burden of the lament was, "Go on, we follow." The friends, who came from long distances to mourn, wore wreaths of green leaves or lycopodium. Sometimes the body was buried; in other parts of the country it was placed in a little house with the greenstone club, etc., of the deceased; sometimes in two pieces of a canoe placed upright together, the corpse being tied in a sitting posture on a grating through which the decomposed parts fell; at other times it was placed in a small canoe and set up in the branches of a tree. Slaves were killed sometimes, and the chief wife strangled herself, to be buried with her lord. A *taro* root was placed in the hand of a dead child that it might have food for its journey to *Reinga;* food was also buried with a chief. The exhumation took place from a year to two years after death, with intricate ceremonies, including the consecration of the spade with which the body was dug up, the charms for the binding up of the bones, for the scraping, for the bearers, lustrations of those engaged, lifting the *tapu* from them, etc. The bones were scraped, anointed, decorated, painted, and set with feathers. When they had been seen and wept over by all the relatives, they were packed away in the dark ancestral burial cave, or else thrown into some inaccessible rift or deep chasm, lest some enemy might get hold of the skull, to taunt it or to use it as a baler for a canoe. Fish-hooks made from the jaws, and flutes, pins, etc., from the bones, were supposed to be terrible insults to the relatives. Hence the secret sepulture.

Murder must be revenged by every member of the tribe until satisfaction had been obtained. A chief, when dying, left as his last words a reminder of revenge for his people to carry out, and would generally nominate some one person to devote himself to

this especial purpose. Such death orders were looked upon as sacred commands. Vengeance, or propitiation by bloodshed, could be obtained by assaulting a tribe which had nothing to do with the cause of quarrel; but, generally, the tribe or family of the murderer was singled out and a vendetta was declared.

While all of a man's movable property was his own, in consequence of the law of *muru* or plunder, a chief had little he could really call his own, except his personal ornaments, weapons, etc., which were *tapu* by touching his sacred body. A chief could *tapu* a certain thing by saying, "That canoe is my backbone," etc. Then, unless one was of greater power than he, it was untouched, and became really, for all practical purposes, the chief's bodily part. Fire was obtained by friction of wood, and when used for "common fire," was kept lighted as long as possible. Fire-sticks were carried to start new fires with, and new fires were made on all solemn occasions. A chief, too, must have his own sacred fire to sit by, lest some inferior person may have used it, or have used some of his fire to light another on which food was cooked. This would be metaphorically cooking the chief himself. The women and men ate apart, and generally each man ate apart; and eating was all done in the open air, because food would *tapu* the house, and so *tapu* any one entering it. Cannibalism was common formerly, and was accounted for by the desire for revenge—cooking and eating his body being the greatest of insults that could be put upon an enemy. If the person eaten had been a redoubtable enemy, his head was dried as a trophy, and his thigh bones were made into flutes; otherwise the bones were thrown away. Hunting was of but little account, for there were no large animals, but fishing was invested with a network of ceremonies and *tapus*.

MAORI KING WITH HIS GREENSTONE CLUB.

Previous to engaging in war the omens were consulted by taking a number of fern stalks to represent spears, and others to represent the warriors. The spears were thrown at the stalks representing the warrior chiefs singly. If the spear fell on his left side, the man would fall; if on the right, he would live. Then sticks named for enemies were thrown at others named for the men, women, and children who were to remain behind, lest they should

MAORI SALUTATION.

be attacked in the absence of the warriors. A young chief on his first war party received a special baptism, when he and his companions had to stand naked in the water and be sprinkled and charmed. Until he had passed through this ceremony and the bloodshedding he was a nobody. All men on a war party were *tapu* to women, and had to do their own cooking because there were no women along; but they were very particular that food should not be passed by one in front of another, or put near a weapon, or touched by the right hand. When the fight was over the men formed in ranks, three deep, each headed by a priest, who received from every man a portion of hair which he had cut from his victims, and waved it as a wave-offering to the war god while the party sang the war song. Approaching their own tribal land, they performed the ceremony of "turning round to look back." A hole having been dug for each slain enemy chief's head, turning round toward the hostile land the priests waved and shook the heads as a challenge, and to allow them to bid farewell; after which followed other ceremonies, closing with the lifting of the *tapu* from the warriors.

A curious point in the settling of ranks was that the son was greater than his father, because, holding rank by both father and

mother, he was the result of two great people coming together, while his father was only one great person.

The games of the Maoris included kite-flying, tops, cat's cradle, skipping rope, ducking one another, swing (peculiar in character), dart-throwing, wrestling, diving, ball, twirling a disk, various games played with the fingers and hands, a kind of hunt the slipper, slinging, stilts, draughts, proverbs, hide and seek, a game played by boys standing on their heads and marking time with their feet, and dancing. A certain legend is of great interest because it mentions a variety of other amusements, but more so on account of its antiquity. It is known both in Samoa and New Zealand, although so many centuries have elapsed since the separation of the tribes that Samoan is incomprehensible to a Maori.

Omens were drawn from convulsive startings in sleep, and the twitching of the arms and legs outward and inward. Tripping the foot on starting and getting the feet between the toes filled with fern were evil. An itching chin denoted that something oily would be eaten. An ember popping out of fire or the singing of gas from burning wood were ominous. Aërolites, meteors, and the approach of the moon to a large star were unlucky. The unpremeditated stretching out or stepping out with the right hand or foot was accepted as an omen. Omens were drawn from the flight of birds and from dreams, when the soul was supposed to have left the body and wandered in *Te Reinga*. In illness the soul journeyed away and was on the brink of crossing to hades, but returned if the man lived. Messages were sent by the dying to friends gone before. The souls passed from south to north till they came to the extreme northwest point of New Zealand, to *Te Reinga*, the spirit's leap. Here the soul leaped into the sea or slid down the trunk of a tree, the *pohutukawa*. Hence the saying for one dead, "He has slid down the pohutukawa"—and passes to Po (hades). It was only the soul of an offering, as of food, which was accepted by the gods. When the fairies accepted certain jewels, they only took the souls of the ornaments, while the material jewels were returned to the votor. Weapons have not souls exactly, but the weapons which have been used in war have a wonderful *mana* or prestige, power, or influence. Some weapons have come down from the gods, and have their genealogies of owners up to chaos. Such weapons sometimes prophesy, sometimes shift about. They would kill with their subtle power the inferior person who dared to touch them. The souls of the departed were not exactly worshiped, for Maoris hardly had the idea of worship, or were not humbly minded enough to worship. They offered death sacrifices, but it was rather with the idea of pacifying the evil deities and paying honor to a chief than of adoration.—*From the Journal of the Anthropological Institute.*

EDUCATION OF OUR COLORED CITIZENS.

By MAUD WILDER GOODWIN.

WHAT shall we do with the negro? This is not a question of philanthropy, but of self-interest and self-protection. The negro has come to stay. The race at present numbers some seven or eight millions, and actually holds the balance of power numerically in several of the Southern States.

The Black Belt, as it is to-day, is a menace to the country from Mississippi to Maine, because it is black with the darkness of idleness and ignorance and immorality. It must soon be decided whether it shall grow darker and darker, or shall come to shine, bright as the Belt of Orion, with the light of intelligence and industry. The problem touches all who believe that good government rests on good citizenship, and good citizenship on individual enlightenment, that education is the tortoise which supports Atlas in his task of holding up the world.

We are confronted by a solid mass of ignorant citizens, nominally if not actually in possession of the ballot, and potent to make or mar the fabric of the republic. This mass is not decreasing, but increasing. What is to be done about it? Whether we care for the negro or his welfare matters not. If we care for the nation, we must give this question earnest consideration. We are entitled to hold the most divergent opinions on the subject, but we are not entitled to indifference, that fatal policy of letting alone growing evils which has wrecked so many communities.

There can be no divided opinion on the desirability of educating citizens of any race or color. The problem, then, so far as the negro is concerned, resolves itself into three questions: Is he capable of being educated? What system of education best meets his temperament and condition? and How can such education be given him?

To put the last two questions is, of course, to assume an affirmative answer to the first. Assuredly the negro can be educated. We may assume so much of a horse or a dog. How far, is another story, as Rudyard Kipling would say. All speculation on the comparative intellectual capacity of the black race is idle. Any accurate estimate must be based on data which, in the nature of things, can not be available for some centuries to come.

To the closest observers at the South the progress of the negro appears, on the whole, remarkable, though statistics might be prepared to present a different view. It is a well-worn truth that civilization is classification, and so it is proving with the blacks. Some of them have progressed. Some have reverted almost to barbarism. Slavery itself was in its time a great school of civili-

zation. It held a semibarbarous race in close contact with their superiors. When that bond was loosened, those negroes who had the fiber of freedom in them stood erect in independent manhood; the others sank to earth in abject hopelessness.

Twenty-eight years have elapsed since the close of the war. Those years have solved many problems and harmonized many differences, but they have not solved the problem of lifting the mass of the blacks to the plane of intelligent citizenship. There is much secret sympathy at the North with the suppression of the negro vote, because it is believed that it is not so much the result of race prejudice as of the determination of an intelligent minority not to be ruled by an ignorant and degraded majority. To begin civilization with the ballot is like beginning the Bible with Revelations; it is reading backward. Let us not reopen the question of the wisdom of the Government when, hurried on by the passions of both North and South, it armed the negro with the ballot as his sole protection. That is done. Our problem is before us. As the Oriental proverb runs: "To-day is ours; yesterday and to-morrow belong to God."

The negro must be educated; but how? Education is a good word, but, unfortunately, vague. It may include everything from the alphabet to the whole sweep of arts and letters. It may be general or technical; physical, mental, or moral. Let us try to arrive at a more definite understanding of it. There is perhaps no better parallel for the education of a race than the education of a child, only for every five years we must take five hundred. Men *fall* into vice but they *climb* into virtue. Nothing could be more unreasonable than to expect to see any marked change from the conditions engendered by slavery in so brief a period as thirty years; yet we hear the accusation constantly made against the negro that he is still a lazy, idle vagabond. Perhaps he is, but it is only another illustration of Franklin's parable, wherein Abraham is represented as wishing to cast the wanderer out of his tent because he will not worship Jehovah. But the Lord rebuked Abraham, saying, "Have I not borne with thee these ninety and nine years, and couldst thou not bear with him one night?"

Scarcely a day, as history measures time, has elapsed since the negroes, trained for centuries to depend on others for the means of livelihood, found themselves flung rudely into the grim struggle for existence. Not a foot of land was given them by the Government. No one ever heard of a negro reservation. They were left naked to their enemies, not the white men round them, but those far more relentless foes, the accursed slave habits, the inheritance of generations. The fatal weakness of slavery to the enslaved lies in the fact that its teachings strike at the root of

character by eliminating the idea of moral responsibility. No soul, no sin. If the marriage tie may be broken at the will of the master, assuredly it will be at the pleasure of the slave. If the servant is a chattel, there is force in his logic that in converting chicken into slave, he is only changing the form of property. The virtues of the slave are unquestioning obedience and passive resignation. The fundamental virtues of the freeman are self-assertion and active, unflinching resistance to any attack on his rights.

The close of the war saw millions of slaves suddenly enfranchised. How were they to be safely translated from one condition to another, to enjoy liberty without running into license, to defend themselves without offending others—in a word, to become good citizens? To the great good fortune of the negro the contraband camp at Hampton, Va., was placed under the control of General Samuel C. Armstrong—a man fitted for his position, not only by having served in the war as a leader of black troops, but by having passed his boyhood as the son of a missionary in the Hawaiian Islands. Through this early training he had an opportunity of studying close at hand the evolution from barbarism of a dark-skinned Polynesian people strongly resembling in many ways the negro in America.

Describing his early experiences, he wrote, years afterward: "On horseback and in canoe tours with my father and alone around those grandly picturesque volcanic islands, inspecting schools and living much among the natives (then generally Christianized), I noticed how easily the children learned from books, how universally the people attended church and had family prayers—always charmingly hospitable; and yet that they lived pretty much in the old ways, all in one room, including the stranger within their gates, who usually had, however, the benefit of the raised end and a curtain. They seemed to have accepted, but not to have fully adopted, Christianity; for they did not have the conditions of living which make high standards of morality possible."

While heartily in sympathy with the effort to Christianize these people, he was forced to see and deplore the process of pietizing without moralizing, which was repeated later under his eye in the camp-meetings of the South. No heathen is so difficult to deal with, as the negro who has run through the whole gamut of religious experience and still retains his original weakness for pilfering watermelons.

General Armstrong's scientific study of the negro led him early to the belief that the only hope for the black lay, not in being helped, but in being taught to help himself; not in being pauperized, but in being civilized. He made up his mind that any sys-

tem of training, to be successful, must be symmetrical, and must take into account the equal development of heart, hand, and head. It was to work out this theory that he consented to take charge of the school for freedmen which was gradually evolved from the camp at Hampton. Here, on the spot rich in historical memories, where freedom first came to the slave through Benjamin F. Butler's famous order declaring him contraband of war, on the shores of the broad bay where the Monitor and the Merrimac closed in their deadly embrace, General Armstrong opened his educational campaign. It was not the first time he had thought of such a scheme.

"A day-dream of the Hampton School nearly as it is," he says, "had come to me during the war a few times; once in camp during the siege of Richmond, and once one beautiful evening on the Gulf of Mexico, while on the wheel-house of the transfer steamship Illinois, *en route* for Texas, with the Twenty-fifth Army (negro) Corps for frontier duty on the Rio Grande River, whither it had been ordered, under General Sheridan, to watch and if necessary defeat Maximilian in his attempted conquest of Mexico.

"The thing to be done was clear: to train selected negro youth who should go out and teach and lead their people, first by example, by getting land and homes; to give them not a dollar that they could earn for themselves; to teach respect for labor; to replace stupid drudgery with skilled hands; and, to these ends, to build up an industrial system, for the sake not only of self-support and intelligent labor, but also for the sake of character. And it seemed equally clear that the people of the country would support a wise work for the freedmen."

Time has more than justified his foresight. It has proved his plan not alone a wise way, but the only way out of the difficulty. This is the answer to the question, What kind of education is best for the negroes? First, such an industrial training as shall make them masters of their own faculties; then an economic training teaching them how to save and how to spend money; and afterward as high an intellectual education as they shall show capacity and desire for. That will take care of itself. The first essential in making the blacks independent is to make them home-owners and property-holders. This is not a difficult task, for the negroes have a land hunger. The difficulty lies in their improvident habits, which too often result in mortgaged houses and farms.

The emancipation of the slaves in America threatened to follow the same course as the emancipation of the serfs in Russia, where the boons of liberty turned to a calamity and a curse. Slavery, under masters made often considerate by habit, was exchanged for an industrial slavery far more bitter. The emanci-

pated Russian serfs straightway fell into the toils of usurers, who first established and then foreclosed mortgages on the little farms granted to the newly enfranchised. At the South, too, the mortgaged farm has been a weapon of tyranny. Once let a negro own his ground and he is indeed free; once let him own a mortgage on a white man's farm and he is master of the situation. Such is the witness borne by Booker Washington, that eloquent young colored man who, coming to Hampton with fifty cents as his entire capital, worked his way through the school and went out to found a similar institution at Tuskegee, Alabama. He is in himself the best illustration of the progress of the race; and the best hope for the future was unintentionally expressed by a Southern white man, who, after seeing him pass on the street, exclaimed with an oath, "By ——! it's all I can do to help saying '*Mister*' to him."

Booker Washington is firm in the faith that his brothers will never succeed until they learn to depend on themselves, and that self-dependence is best fostered by the ownership of land. A property-owning negro is not only secure of his rights, but he has a vital interest in the stability of government, and thus becomes a citizen in the fullest sense without distinction of race or color. No one man has done as much as General Armstrong to bring about this great industrial revolution. Here is the testimony of the Rev. S. J. Barrows:

"General Armstrong has built a new Uncle Tom's cabin, and it is very different from the old. You may see the difference in the Black Belt. There is the old one with its one door and perhaps no window; and then, not far away, is the new one built by the Hampton graduate, two stories high perhaps, nicely carpeted and furnished, neat spreads on the table, and something better than 'hog and hominy' to eat, a cabinet organ in the room, books on the shelf. Such a home is a beacon-light in the community to diffuse intelligence and the spirit of order and progress. That is what Hampton is doing. It is building homes and schools all through the South. What a cloud of witnesses we should have, could we summon those seven hundred graduates, each one bringing the implements of his trade—the carpenter with his saw, the blacksmith with his hammer, the harnessmaker with his knife, the farmer with his hoe! What a long line there would be of the graduates alone! And then add the one hundred and twenty-nine thousand pupils they have taught and the two thousand teachers again that have been drawn from this army of pupils! It would take two days for them all to march through the streets of Boston!"

A man once excused himself for begging from Dr. Johnson by explaining, "You see, my dear sir, I must live." "Really," re-

plied the sturdy old doctor, "I don't see the necessity." Now, it is a cold fact in political economy that the killing off of one third of the black population at the South would probably prove a benefit to civilization. It would work like the thinning out of a forest jungle, leaving room for the sun and air to reach the survivors; but the law has not yet authorized this process of scientific weeding out of the unfittest. The question is not, Shall the negro poor live? but How shall they live? Pauperism does not stop procreation. The next generation will be called upon to solve our problem several times multiplied.

Pauperism not only breeds paupers: it kills thrift. Nothing is so extravagant as poverty. It is a universally acknowledged fact among shopkeepers at the South that the black customers are the best customers. None care so little what price is put upon an article, none inquire so little into intrinsic values, and none are so heedless of the adaptation of the purchase to the needs. Some wit has observed, on the difference between men and women as shoppers, that men will pay two dollars for a one-dollar article which they want, whereas women will pay one dollar for a two-dollar article which they *don't* want. The negro combines the weakness of both. Every traveler in the South smiles over the new buggy standing beside the shanty which owns neither stable nor horse; the gorgeous plush album, guiltless of pictures, but treasured in tissue paper by the poor woman who can scarcely make the rags meet across her breast. There is a humorous side to it, but there is a pathetic side, too, in that unquenchable thirst for beauty which is part of the Oriental nature. The negro really feels what the rest of us say in jest, "Give us the luxuries of life, and we'll do without the necessaries." Lazy, improvident, unpractical, the black man as a worker is brought into competition not only with the Southern whites, but with the Yankees—those Phœnicians of the Western world who drive bargains as naturally as the negro drives a mule, who haggle over the price of a postage-stamp, who rise early and go to bed late out of breath from the pursuit of the nimble sixpence. The negro is a Rip Van Winkle who has suddenly waked into a dizzy world of prosperity and progress. He can not hope at present to compete for the prizes, but is he therefore to be counted out as a factor in the world's work? "Not so," says General Armstrong, and as a proof of it he points to the achievements of Hampton.

That school which first rose on his vision that summer night on the Mexican Gulf, now stretches its substantial arms of stone and brick and iron to the water's edge. Its smoking chimneys, its ringing forges, its whirr of wheels, all bespeak the busy life within. In each one of the forty buildings connected with the school some form of education is being carried on. At one angle

stand the Huntington Industrial Works, where lumber passes from the felled log into finished carpentry under the hands of joiners and carpenters. The boys who have been trained in this school will never be at a loss to get work. They can put up their own houses and those of their neighbors, and teach by example and precept in their turn. Wheelwright and blacksmith shops stand close at hand. Dressmaking establishments and cooking schools meanwhile are training women to equal usefulness.

Hampton stands, above all, for industrial education. The institutions at Petersburg, Nashville, and Atlanta are all working for the education of the colored race. Some of them have technical schools, but it is at Hampton alone that industrial training and manual labor form the keystone of the educational arch. The students here are taught not only to work, but to be proud of working; and when the higher education is earned it is worth more because it is founded on the solid basis of hand work. Thoroughness and accuracy, the two great qualifications for scholarship, are taught at the carpenter's bench and the blacksmith's forge. But the artisans are not left untaught in other things. The night school is crowded every evening with eager learners of two races. Negroes and Indians study side by side, with benefit to both races. Their horizon is widened by the interchange of experiences from such diverse regions as the West and South, the prairie and the cotton field. The habits of the wandering tribes and the sons of the soil are full of interest to the observers, and, even as children learn from each other more readily than from grown people, so these child races are teaching and training one another.

When the Indians were introduced into the school, some fifteen years ago, while the Hon. Carl Schurz was Secretary of the Interior under Hayes, it was feared that the discipline and general morale of the institution would suffer. These, on the contrary, have steadily improved. General Armstrong was one of the first educators to adopt the principle of student-government. The boys, Negro and Indian, are formed into a battalion. Cases of insubordination are dealt with by a court martial detailed from among the officers, who report their sentence for the approval of the faculty of the school. The system is admirably adapted to its purpose. It develops both discipline and a sense of honor. To compel a boy, under ordinary circumstances, to report the conduct of his comrades is to make him a spy and informer, but when he acts as guard or sentinel he falls at once into the attitude of military obedience.

Nothing in the conduct of the school shows keener insight into the character of the negro than the establishment of this semi-military basis of organization. A uniform, gay with straps and

brass buttons, is dear to his heart. His feet keep step instinctively to the tap of the drum, and the flag behind which he marches is a perpetual reminder to him that he is an integral part of a great nation which expects something from him in return for the freedom and citizenship which it has bestowed. This military drill has a still more far-reaching influence in stimulating that ability for organization which is one of the latest developments of civilization. Here the negro is manifestly deficient. He fights and works well under the command and oversight of his superior, just as the Sepoys have been found in India to need not only English officers but a few English regulars to supply the backbone as well as the brains—literally, the sinews of war. This mental and moral muscle is just what Hampton is supplying, teaching the negro first to help himself and then to lend a hand to others, to organize, to teach, and to command.

The normal school is the highest grade in the Hampton Institute. It has four classes—the intermediate, the junior, the middle, and the senior. At the end of the middle year the students who desire to make teaching their life work are sent away for a year of practice, from which they return with a more adequate notion of the needs of their people and the advantages open to them at Hampton. So much insisted on is this duty of missionary work of instruction in the Black Belt and other strongholds of ignorance in the South, that the teachers say that the graduates whom they meet in New York and other Northern cities occupying positions of ease and profit are so ashamed of shirking their duties that they cross the street and strive to avoid encountering their old instructors, whose just expectations they have thus disappointed.

Every institution, some one has said, is the shadow of one man, and Hampton is the shadow of General Armstrong. He has been not alone the founder, but the upbuilder. It is his eloquence which has drawn forth the gold from the pockets of the rich and transformed it into brick and mortar and books and models for the benefit of his experiment.

Phillips Brooks, whose great heart went out to all greatness, said of General Armstrong: "He has touched the fountains of generosity in stingy men. He has taught men the glory and the beauty and the happiness of being stewards of the Lord. He has made men feel as they never dreamed of feeling. Such has been the power of his speech that the frozen streams have melted and the currents have flowed joyously, singing as they went, and men have thanked him for teaching them to be generous." But no one man, however eloquent or however able, could have created that industrial village at Hampton. It is the product of organized enthusiasm. Individual enthusiasm is the old flint and

spark of the savage, which struck fire only by direct contact and after much friction. Organized enthusiasm is the electric light with the whole energy of the battery behind it. It is this organized enthusiasm of many people in many places which has made Hampton what it is. General Armstrong's genius has lain in understanding how to utilize emotion to be sure that it turned a crank and did not escape in steam. For twenty-five years he has toiled and thought and fought for the school — now traveling hither and yon through the North to collect funds, and then flying back to inspire and direct the work at the South. No man could stand such a strain forever, and last year, in Boston, paralysis laid its warning hand on that tireless brain and said, "Be still!" But nothing short of death itself can enforce that command. The brain and voice are busy still, but not with their old-time energy. Now he is calling for aid. "He has," as Mrs. Julia Ward Howe said, "been through two wars—the war of fire and bloodshed, and the war of faith and zeal." Now he is struck down, like Moses, at the entrance to the promised land of success, and asks only to see into it.

To each age its own problems. The men and women of General Armstrong's generation were carried above and beyond themselves by the impulse of a great, soul-stirring cause. The young people of to-day can never know the electric thrill of patriotism which ran through the country in successive shocks from the first gun echoing from Sumter to the solemn day of Lincoln's death. But there is a heroic work for them to do:

> "New occasions teach new duties,
> Time makes ancient good uncouth;
> They must upward still and onward,
> Who would keep abreast of truth."

"The Boys in Blue did a fearful but necessary work of destruction," said Lincoln of the heroes of Gettysburg. "It is for us to finish what they began. Their task was *de*struction; ours is *con*struction. Theirs was the emancipation of the slave; ours the enlightenment of the citizen." So widespread has been the feeling of the dignity and worth of the work done in this great cause at Hampton, that it has taken form in an association bearing the name of the founder of the school, and known as the Armstrong Association. Its whole purpose is to support the industrial education of the negro and, incidentally, of the Indian. It aims to be national, not sectional, and should prove a strong bond between North and South. It does not propose to contribute a cent toward philanthropy or charity at the South. Hampton Institute is no more a charitable institution than Yale or Harvard. It is a noble educational plant insufficiently endowed. Its alumni are poor;

they can give it only gratitude and sympathy, and, as some cynic has observed, the bonds of sympathy bear no coupons. This criticism, however, is only a surface truth, for no cause ever failed for lack of funds, if it had enough vital sympathy behind it.

There is a lake on a mountain-top in Missouri, without visible outlet or inlet, which yet rises and falls several feet. What is the explanation of the mystery? It is fed by an ebbing and flowing underground river. So it is with great enterprises. They are borne on the current of popular enthusiasm—unseen, it may be, but never unfelt. So it is with Hampton. Its success hangs on popular support, and on its success hangs the experiment of industrial education as a solution of the negro problem.

This is a great national question. It intimately concerns the white population at the South, whose welfare, whether they will or not, is bound up with that of the blacks, so that the sarcastic advice, "Educate your masters!" becomes literal counsel of the truest and wisest kind. Nor are we of the North indifferent observers. So bound together is this nation by the iron bands of railroads and telegraph wires that the issue of affairs in the most distant South is of vital interest to us. Let it not be said of the thinkers of to-day as of those blind ones who watched the condition of France before the Revolution, that the philosophers were duller than the fribbles. Let us clearly recognize the difficulty and complexity of the problem with which we have to deal, and then let us address ourselves to its solution soberly, earnestly, and unremittingly.

A DISCUSSION has arisen concerning the manner in which the Egyptian tombs may have been lighted for the execution of the elaborate paintings that are found in them. Any light that would smoke appears to be ruled out, for it could not have failed to leave its mark, which is not there. Mr. Newman, an American artist, who has spent several winters on the Nile, studying and painting tombs and temples, has not been able to suggest any other solution of the problem than the use of the electric light. Mr. W. Flinders Petrie is not yet ready to invoke the electric light, but believes that sunlight was sent into the dark passages by the use of mirrors. He says: "A very small amount of reflected sunshine is enough to work by. I have taken photographs at Gizeh (which require far more light than is needed by a painter or sculptor) by means of four successive reflections of sunshine from common sheets of tin plate, such as biscuit-tin lids. These four reflections sent the light round corners, into what was absolutely dark space, a distance of over thirty feet, and the effect was brilliant to the eye. I feel certain, therefore, that with larger reflectors there would be no difficulty whatever in lighting any part of the Kings' Tombs more brightly than by small lamps."

AN American, Mr. Henry, in Longuyon, France, has constructed a clock entirely of paper, which has run regularly for two years, with no greater variation than a minute a month.

THE INADEQUACY OF "NATURAL SELECTION."

By HERBERT SPENCER.

STUDENTS of psychology are familiar with the experiments of Weber on the sense of touch. He found that different parts of the surface differ widely in their ability to give information concerning the things touched. Some parts, which yielded vivid sensations, yielded little or no knowledge of the size or form of the thing exciting it; whereas other parts, from which there came sensations much less acute, furnished clear impressions respecting tangible characters, even of relatively small objects. These unlikenesses of tactual discriminativeness he ingeniously expressed by actual measurements. Taking a pair of compasses, he found that if they were closed so nearly that the points were less than one twelfth of an inch apart, the end of the forefinger could not perceive that there were two points: the two points seemed one. But when the compasses were opened so that the points were one twelfth of an inch apart, then the end of the forefinger distinguished the two points. On the other hand, he found that the compasses must be opened to the extent of two and a half inches before the middle of the back could distinguish between two points and one. That is to say, as thus measured, the end of the forefinger has thirty times the tactual discriminativeness which the middle of the back has.

Between these extremes he found gradations. The inner surfaces of the second joints of the fingers can distinguish separateness of positions only half as well as the tip of the forefinger. The innermost joints are still less discriminating, but have a power of discrimination equal to that of the tip of the nose. The end of the great toe, the palm of the hand, and the cheek, have alike one fifth of the perceptiveness which the tip of the forefinger has; and the lower part of the forehead has but one half that possessed by the cheek. The back of the hand and the crown of the head are nearly alike in having but a fourteenth or a fifteenth of the ability to perceive positions as distinct, which is possessed by the finger-end. The thigh, near the knee, has rather less, and the breast less still; so that the compasses must be more than an inch and a half apart before the breast distinguishes the two points from one another.

What is the meaning of these differences? How, in the course of evolution, have they been established? If "natural selection" or survival of the fittest is the assigned cause, then it is required to show in what way each of these degrees of endowment has advantaged the possessor to such extent that not infrequently life has been directly or indirectly preserved by it. We might rea-

sonably assume that in the absence of some differentiating process, all parts of the surface would have like powers of perceiving relative positions. They can not have become widely unlike in perceptiveness without some cause. And if the cause alleged is natural selection, then it is necessary to show that the greater degree of the power possessed by this part than by that, has not only conduced to the maintenance of life, but has conduced so much that an individual in whom a variation had produced better adjustment to needs, thereby maintained life when some others lost it; and that among the descendants inheriting this variation, there was a derived advantage such as enabled them to multiply more than the descendants of individuals not possessing it. Can this, or anything like this, be shown?

That the superior perceptiveness of the forefinger-tip has thus arisen, might be contended with some apparent reason. Such perceptiveness is an important aid to manipulation, and may have sometimes given a life-saving advantage. In making arrows or fish-hooks, a savage possessing some extra amount of it may have been thereby enabled to get food where another failed. In civilized life, too, a seamstress with well-endowed finger-ends might be expected to gain a better livelihood than one with finger-ends which were obtuse; though this advantage would not be so great as appears. I have found that two ladies whose finger-ends were covered with glove-tips, reducing their sensitiveness from one twelfth of an inch between compass points to one seventh, lost nothing appreciable of their quickness and goodness in sewing. An experience of my own here comes in evidence. Toward the close of my salmon-fishing days, I used to observe what a bungler I had become in putting on and taking off artificial flies. As the tactual discriminativeness of my finger-ends, recently tested, comes up to the standard specified by Weber, it is clear that this decrease of manipulative power, accompanying increase of age, was due to decrease in the delicacy of muscular co-ordination and sense of pressure—not to decrease of tactual discriminativeness. But not making much of these criticisms, let us admit the conclusion that this high perceptive power possessed by the forefinger-end may have arisen by survival of the fittest; and let us limit the argument to the other differences.

How about the back of the trunk and its face? Is any advantage derived from possession of greater tactual discriminativeness by the last than by the first? The tip of the nose has more than three times the power of distinguishing relative positions which the lower part of the forehead has. Can this greater power be shown to have any advantage? The back of the hand has scarcely more discriminative ability than the crown of the head, and has only one fourteenth of that which the finger-tip has.

Why is this? Advantage might occasionally be derived if the back of the hand could tell us more than it does about the shapes of the surfaces touched. Why should the thigh near the knee be twice as perceptive as the middle of the thigh? And, last of all, why should the middle of the forearm, middle of the thigh, middle of the back of the neck, and middle of the back, all stand on the lowest level, as having but one thirtieth of the perceptive power which the tip of the forefinger has? To prove that these differences have arisen by natural selection, it has to be shown that such small variation in one of the parts as might occur in a generation —say one tenth extra amount—has yielded an appreciably greater power of self-preservation, and that those inheriting it have continued to be so far advantaged as to multiply more than those who, in other respects equal, were less endowed with this trait. Does any one think he can show this?

But if this distribution of tactual perceptiveness can not be explained by survival of the fittest, how can it be explained? The reply is that, if there has been in operation a cause which it is now the fashion among biologists to ignore or deny, these various differences are at once accounted for. This cause is the inheritance of acquired characters. As a preliminary to setting forth the argument showing this, I have made some experiments.

It is a current belief that the fingers of the blind, more practiced in tactual exploration than the fingers of those who can see, acquire greater discriminativeness: especially the fingers of those blind who have been taught to read from raised letters. Not wishing to trust to this current belief, I recently tested two youths, one of fifteen and the other younger, at the School for the Blind in Upper Avenue Road, and found the belief to be correct. Instead of being unable to distinguish between points of the compasses until they were opened to one twelfth of an inch apart, I found that both of them could distinguish between points when only one fourteenth of an inch apart. They had thick and coarse skins; and doubtless, had this intervening obstacle so produced been less, the discriminative power would have been greater. It afterward occurred to me that a better test would be furnished by those whose finger-ends are exercised in tactual perceptions, not occasionally, as by the blind in reading, but all day long in pursuit of their occupations. The facts answered expectation. Two skilled compositors, on whom I experimented, were both able to distinguish between points when they were only one seventeenth of an inch apart. Thus we have clear proof that constant exercise of the tactual nervous structures leads to further development.*

* Let me here note in passing a highly significant implication. The development of nervous structures which in such cases takes place, can not be limited to the finger-ends.

Now if acquired structural traits are inheritable, the various contrasts above set down are obvious consequences; for the gradations in tactual perceptiveness correspond with the gradations in the tactual exercise of the parts. Save by contact with clothes, which present only broad surfaces having but slight and indefinite contrasts, the trunk has but little converse with external bodies, and it has but small discriminative power; but what discriminative power it has is greater on its face than on its back, corresponding to the fact that the chest and abdomen are much more frequently explored by the hands: this difference being probably in part inherited from inferior creatures, for, as we may see in dogs and cats, the belly is far more accessible to feet and tongue than the back. No less obtuse than the back are the middle of the back of the neck, the middle of the forearm, and the middle of the thigh; and these parts have but rare experiences of irregular foreign bodies. The crown of the head is occasionally felt by the fingers, as also the back of one hand by the fingers of the other; but neither of these surfaces, which are only twice as perceptive as the back, is used with any frequency for touching objects, much less for examining them. The lower part of the forehead, though more perceptive than the crown of the head, in correspondence with a somewhat greater converse with the hands, is less than one third as perceptive as the tip of the nose; and manifestly, both in virtue of its relative prominence, in virtue of its contacts with things smelt at, and in virtue of its frequent acquaintance with the handkerchief, the tip of the nose has far greater tactual experience. Passing to the inner surfaces of the hands, which, taken as wholes, are more constantly occupied in touching than are the back, breast, thigh, forearm, forehead, or back of the hand, Weber's scale shows that they are much more perceptive, and that the degrees of perceptiveness of different

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If we figure to ourselves the separate sensitive areas which severally yield independent feelings, as constituting a network (not, indeed, a network sharply marked out, but probably one such that the ultimate fibrils in each area intrude more or less into adjacent areas, so that the separations are indefinite), it is manifest that when, with exercise, the structure has become further elaborated, and the meshes of the network smaller, there must be a multiplication of fibers communicating with the central nervous system. If two adjacent areas were supplied by branches of one fiber, the touching of either would yield to consciousness the same sensation: there could be no discrimination between points touching the two. That there may be discrimination, there must be a distinct connection between each area and the tract of gray matter which receives the impressions. Nay more, there must be, in this central recipient tract, an added number of the separate elements which, by their excitement, yield separate feelings. So that this increased power of tactual discrimination implies a peripheral development, a multiplication of fibers in the trunk-nerve, and a complication of the nerve-center. It can scarcely be doubted that analogous changes occur under analogous conditions throughout all parts of the nervous system—not in its sensory appliances only, but in all its higher co-ordinating appliances up to the highest.

parts correspond with their tactual activities. The palms have but one fifth the perceptiveness possessed by the forefinger-ends; the inner surfaces of the finger-joints next the palms have but one third, while the inner surfaces of the second joints have but one half. These abilities correspond with the facts that whereas the inner parts of the hand are used only in grasping things, the tips of the fingers come into play not only when things are grasped, but when such things, as well as smaller things, are felt at or manipulated. It needs but to observe the relative actions of these parts in writing, in sewing, in judging textures, etc., to see that above all other parts the finger-ends, and especially the forefinger-ends, have the most multiplied experiences. If, then, it be that the extra perceptiveness acquired from extra tactual activities, as in a compositor, is inheritable, these gradations of tactual perceptiveness are explained.

Doubtless some of those who remember Weber's results, have had on the tip of the tongue the argument derived from the tip of the tongue. This part exceeds all other parts in power of tactual discrimination: doubling, in that respect, the power of the forefinger-tip. It can distinguish points that are only one twenty-fourth of an inch apart. Why this unparalleled perceptiveness? If survival of the fittest be the ascribed cause, then it has to be shown what the advantages achieved have been; and, further, that those advantages have been sufficiently great to have had effects on the maintenance of life.

Besides tasting, there are two functions conducive to life, which the tongue performs. It enables us to move about food during mastication, and it enables us to make many of the articulations constituting speech. But how does the extreme discriminativeness of the tongue-tip aid these functions? The food is moved about, not by the tongue-tip, but by the body of the tongue; and even were the tip largely employed in this process, it would still have to be shown that its ability to distinguish between points one twenty-fourth of an inch apart, is of service to that end, which can not be shown. It may, indeed, be said that the tactual perceptiveness of the tongue-tip serves for detection of foreign bodies in the food, as plum-stones or as fish-bones. But such extreme perceptiveness is needless for the purpose—a perceptiveness equal to that of the finger-ends would suffice; and further, even were such extreme perceptiveness useful, it could not have caused survival of individuals who possessed it in slightly higher degrees than others. It needs but to observe a dog crunching small bones, and swallowing with impunity the sharp-angled pieces, to see that but a very small amount of mortality would be prevented.

But what about speech? Well, neither here can there be

shown any advantage derived from this extreme perceptiveness. For making the *s* and *z*, the tongue has to be partially applied to a portion of the palate next the teeth. Not only, however, must the contact be incomplete, but its place is indefinite—may be half an inch further back. To make the *sh* and *zh*, the contact has to be made, not with the tip, but with the upper surface of the tongue; and must be an incomplete contact. Though, for making the liquids, the tip of the tongue and the sides of the tongue are used, yet the requisite is not any exact adjustment of the tip, but an imperfect contact with the palate. For the *th*, the tip is used along with the edges of the tongue; but no perfect adjustment is required, either to the edges of the teeth, or to the junction of the teeth with the palate, where the sound may equally well be made. Though for the *t* and *d* complete contact of the tip and edges of the tongue with the palate is required, yet the place of contact is not definite, and the tip takes no more important share in the action than the sides. Any one who observes the movements of his tongue in speaking, will find that there occur no cases in which the adjustments must have an exactness corresponding to the extreme power of discrimination which the tip possesses: for speech, this endowment is useless. Even were it useful, it could not be shown that it has been developed by survival of the fittest; for though perfect articulation is useful, yet imperfect articulation has rarely such an effect as to impede a man in the maintenance of his life. If he is a good workman, a German's interchanges of *b's* and *p's* do not disadvantage him. A Frenchman who, in place of the sound of *th*, always makes the sound of *z*, succeeds as a teacher of music or dancing, no less than if he achieved the English pronunciation. Nay, even such an imperfection of speech as that which arises from cleft palate, does not prevent a man from getting on if he is capable. True, it may go against him as a candidate for Parliament, or as an "orator" of the unemployed (mostly not worth employing). But in the struggle for life he is not hindered by the effect to the extent of being less able than others to maintain himself and his offspring. Clearly, then, even if this unparalleled perceptiveness of the tongue-tip is required for perfect speech, this use is not sufficiently important to have been developed by natural selection.

How, then, is this remarkable trait of the tongue-tip to be accounted for? Without difficulty, if there is inheritance of acquired characters. For the tongue-tip has, above all other parts of the body, unceasing experiences of small irregularities of surface. It is in contact with the teeth, and either consciously or unconsciously is continually exploring them. There is hardly a moment in which impressions of adjacent but different positions are not being yielded to it by either the surfaces of the teeth or

their edges; and it is continually being moved about from some of them to others. No advantage is gained. It is simply that the tongue's position renders perpetual exploration almost inevitable; and by perpetual exploration is developed this unique power of discrimination. Thus the law holds throughout, from this highest degree of perceptiveness of the tongue-tip to its lowest degree on the back of the trunk; and no other explanation of the facts seems possible.

"Yes, there is another explanation," I hear some one say: "they may be explained by *panmixia*." Well, in the first place, as the explanation by *panmixia* implies that these gradations of perceptiveness have been arrived at by the dwindling of nervous structures, there lies at the basis of the explanation an unproved and improbable assumption; and, even were there no such difficulty, it may with certainty be denied that *panmixia* can furnish an explanation. Let us look at its pretensions.

It was not without good reason that Bentham protested against metaphors. Figures of speech in general, valuable as they are in poetry and rhetoric, can not be used without danger in science and philosophy. The title of Mr. Darwin's great work furnishes us with an instance of the misleading effects produced by them. It runs:—The Origin of Species by means of Natural Selection, or the preservation of Favored Races in the Struggle for Life. Here are two figures of speech which conspire to produce an impression more or less erroneous. The expression "natural selection" was chosen as serving to indicate some parallelism with artificial selection—the selection exercised by breeders. Now selection connotes volition, and thus gives to the thoughts of readers a wrong bias. Some increase of this bias is produced by the words in the second title, "favored races;" for anything which is favored implies the existence of some agent conferring a favor. I do not mean that Mr. Darwin himself failed to recognize the misleading connotations of his words, or that he did not avoid being misled by them. In chapter iv of the Origin of Species he says that, considered literally, "natural selection is a false term," and that the personification of Nature is objectionable; but he thinks that readers, and those who adopt his views, will soon learn to guard themselves against the wrong implications. Here I venture to think that he was mistaken. For thinking this there is the reason that even his disciple, Mr. Wallace—no, not his disciple, but his co-discoverer, ever to be honored—has apparently been influenced by them. When for example, in combating a view of mine, he says that "the very thing said to be impossible by variation and natural selection has been again and again effected by variation and artificial selection"; he seems clearly to imply that the

processes are analogous and operate in the same way. Now this is untrue. They are analogous only within certain narrow limits; and, in the great majority of cases, natural selection is utterly incapable of doing that which artificial selection does.

To see this it needs only to de-personalize Nature, and to remember that, as Mr. Darwin says, Nature is "only the aggregate action and product of many natural laws [forces]." Observe its relative shortcomings. Artificial selection can pick out a particular trait, and, regardless of other traits of the individuals displaying it, can increase it by selective breeding in successive generations. For, to the breeder or fancier, it matters little whether such individuals are otherwise well constituted. They may be in this or that way so unfit for carrying on the struggle for life, that, were they without human care, they would disappear forthwith. On the other hand, if we regard Nature as that which it is, an assemblage of various forces, inorganic and organic, some favorable to the maintenance of life and many at variance with its maintenance—forces which operate blindly—we see that there is no such selection of this or that trait, but that there is a selection only of individuals which are, by the aggregate of their traits, best fitted for living. And here I may note an advantage possessed by the expression "survival of the fittest"; since this does not tend to raise the thought of any one character which, more than others, is to be maintained or increased; but tends rather to raise the thought of a general adaptation for all purposes. It implies the process which Nature can alone carry on—the leaving alive of those which are best able to utilize surrounding aids to life, and best able to combat or avoid surrounding dangers. And while this phrase covers the great mass of cases in which there are preserved well-constituted individuals, it also covers those special cases which are suggested by the phrase "natural selection," in which individuals succeed beyond others in the struggle for life by the help of particular characters which conduce in important ways to prosperity and multiplication. For now observe the fact which here chiefly concerns us, that survival of the fittest can increase any serviceable trait only if that trait conduces to prosperity of the individual, or of posterity, or of both, *in an important degree*. There can be no increase of any structure by natural selection unless, amid all the slightly varying structures constituting the organism, increase of this particular one is so advantageous as to cause greater multiplication of the family in which it arises than of other families. Variations which, though advantageous, fail to do this, must disappear again. Let us take a case.

Keenness of scent in a deer, by giving early notice of approaching enemies, subserves life so greatly that, other things equal, an

individual having it in an unusual degree is more likely than others to survive, and, among descendants, to leave some similarly endowed or more endowed, who again transmit the variation with, in some cases, increase. Clearly this highly useful power may be developed by natural selection. So also, for like reasons, may quickness of vision and delicacy of hearing. Though it may be remarked in passing that since this extra sense-endowment, serving to give early alarm, profits the herd as a whole, which takes the alarm from one individual, selection of it is not so easy, unless it occurs in a conquering stag. But now suppose that one member of the herd—perhaps because of more efficient teeth, perhaps by greater muscularity of stomach, perhaps by secretion of more appropriate gastric juices—is enabled to eat and digest a not uncommon plant which the others refuse. This peculiarity may, if food is scarce, conduce to better self-maintenance, and better fostering of young, if the individual is a hind. But unless this plant is abundant, and the advantage consequently great, the advantages which other members of the herd gain from other slight variations may be equivalent. This one has unusual agility and leaps a chasm which others balk at. That one develops longer hair in winter, and resists the cold better. Another has a skin less irritated by flies, and can graze without so much interruption. Here is one which has an unusual power of detecting food under the snow; and there is one which shows extra sagacity in the choice of a shelter from wind and rain. That the variation giving the ability to eat a plant before unutilized, may become a trait of the herd, and eventually of a variety, it is needful that the individual in which it occurs shall have more descendants, or better descendants, or both, than have the various other individuals severally having their small superiorities. If these other individuals severally profit by their small superiorities, and transmit them to equally large numbers of offspring, no increase of the variation in question can take place: it must soon be canceled. Whether in the Origin of Species Mr. Darwin has recognized this fact, I do not remember, but he has certainly done it by implication in his Animals and Plants under Domestication. Speaking of variations in domestic animals, he there says that, "Any particular variation would generally be lost by crossing, reversion, and the accidental destruction of the varying individuals, unless carefully preserved by man" (Vol. II, 292). That which survival of the fittest does in cases like the one I have instanced is to keep all faculties up to the mark, by destroying such as have faculties in some respect below the mark; and it can produce development of some one faculty only if that faculty is predominantly important. It seems to me that many naturalists have practically lost sight of this, and assume that natural selec-

tion will increase *any* advantageous trait. Certainly a view now widely accepted assumes as much.

The consideration of this view, to which the foregoing paragraph is introductory, may now be entered upon. This view concerns, not direct selection, but what has been called, in questionable logic, "reversed selection"—the selection which effects, not increase of an organ, but decrease of it. For as, under some conditions, it is of advantage to an individual and its descendants to have some structure of larger size, it may be, under other conditions—namely, when the organ becomes useless—of advantage to have it of smaller size; since, even if it is not in the way, its weight and the cost of its nutrition are injurious taxes on the organism. But now comes the truth to be emphasized. Just as direct selection can increase an organ only in certain cases, so can reversed selection decrease it only in certain cases. Like the increase produced by a variation, the decrease produced by one must be such as will sensibly conduce to preservation and multiplication. It is, for instance, conceivable that were the long and massive tail of the kangaroo to become useless (say by the forcing of the species into a mountainous and rocky habitat filled with brushwood), a variation which considerably reduced the tail might sensibly profit the individual in which it occurred; and, in seasons when food was scarce, might cause survival when individuals with large tails died. But the economy of nutrition must be considerable before any such result could occur. Suppose that in this new habitat the kangaroo had no enemies; and suppose that, consequently, quickness of hearing not being called for, large ears gave no greater advantage than small ones. Would an individual with smaller ears than usual survive and propagate better than other individuals in consequence of the economy of nutrition achieved? To suppose this is to suppose that the saving of a grain or two of protein per day would determine the kangaroo's fate.

Long ago I discussed this matter in the Principles of Biology (§ 166), taking as an instance the decrease of the jaw implied by the crowding of the teeth, and now proved by measurement to have taken place. Here is the passage:—

"No functional superiority possessed by a small jaw over a large jaw, in civilized life, can be named as having caused the more frequent survival of small-jawed individuals. The only advantage which smallness of jaw might be supposed to give, is the advantage of economized nutrition; and this could not be great enough to further the preservation of men possessing it. The decrease of weight in the jaw and co-operative parts that has arisen in the course of many thousands of years, does not amount to more than a few ounces. This decrease has to be divided among the many generations that have lived and died in the interval. Let us admit that the weight of these parts diminished to the extent of

an ounce in a single generation (which is a large admission); it still can not be contended that the having to carry an ounce less in weight, or the having to keep in repair an ounce less of tissue, could sensibly affect any man's fate. And if it never did this—nay, if it did not cause a *frequent* survival of small-jawed individuals where large-jawed individuals died, natural selection could neither cause nor aid diminution of the jaw and its appendages."

When writing this passage in 1864, I never dreamt that a quarter of a century later, the supposable cause of degeneration here examined and excluded as impossible, would be enunciated as not only *a* cause, but *the* cause, and the sole cause. This, however, has happened. Weismann's theory of degeneration by *panmixia*, is that when an organ previously maintained of the needful size by natural selection, is no longer maintained at that size, because it has become useless (or because a smaller size is equally useful), it results that among the variations in the size, which take place from generation to generation, the smaller will be preserved continually, and that so the part will decrease. And this is concluded without asking whether the economy in nutrition achieved by the smaller variation, will sensibly affect the survival of the individual, and the multiplication of its stirp. To make clear his hypothesis, and to prepare the way for criticism, let me quote the example he himself gives when contrasting the alleged efficiency of dwindling by *panmixia* with the alleged inefficiency of dwindling from disuse. This example is furnished him by the *Proteus*.

Concerning the "blind fish and amphibia" found in dark places, which have but rudimentary eyes "hidden under the skin," he argues that "it is difficult to reconcile the facts of the case with the ordinary theory that the eyes of these animals have simply degenerated through disuse." After giving instances of rapid degeneration of disused organs, he argues that if "the effects of disuse are so striking in a single life, we should certainly expect, if such effects can be transmitted, that all traces of an eye would soon disappear from a species which lives in the dark." Doubtless this is a reasonable conclusion. To explain the facts on the hypothesis that acquired characters are inheritable seems very difficult. One possible explanation may indeed be named. It appears to be a general law of organization that structures are stable in proportion to their antiquity; that while organs of relatively modern origin have but a comparatively superficial root in the constitution, and readily disappear if the conditions do not favor their maintenance, organs of ancient origin have deep-seated roots in the constitution, and do not readily disappear. Having been early elements in the type, and having continued to be reproduced as parts of it during a period extending throughout many geological epochs, they are comparatively persistent. Now the

eye answers to this description as being a very early organ.* But waiving possible interpretations, let us admit that here is a difficulty—a difficulty like countless others which the phenomena of evolution present, as, for instance, the acquirement of such a habit as that of the *Vanessa* larva, hanging itself up by the tail and then changing into a chrysalis which usurps its place—a difficulty which, along with multitudes, has to await future solution, if any can be found. Let it be granted, I say, that here is a serious obstacle in the way of the hypothesis; and now let us turn to the alternative hypothesis, and observe whether it is not met by difficulties which are much more serious. Weismann writes:

"The caverns in Carniola and Carinthia, in which the blind *Proteus* and so many other blind animals live, belong geologically to the Jurassic formation; and although we do not exactly know when, for example, the *Proteus* first entered them, the low organization of this amphibian certainly indicates that it has been sheltered there for a very long period of time, and that thousands of generations of this species have succeeded one another in the caves.

"Hence there is no reason to wonder at the extent to which the degeneration of the eye has been already carried in the *Proteus*, even if we assume that it is merely due to the cessation of the conserving influence of natural selection.

"But it is unnecessary to depend upon this assumption alone, for when a useless organ degenerates, there are also other factors which demand consideration—namely, the higher development of other organs which compensate for the loss of the degenerating structure, or the increase in size of adjacent parts. If these newer developments are of advantage to the species, they finally come to take the place of the organ which natural selection has failed to preserve at its point of highest perfection."†

On these paragraphs let me first remark that one cause is multiplied into two. The cause is stated in the abstract, and it is then re-stated in the concrete, as though it were another cause. Manifestly, if by decrease of the eye an economy of nutriment is achieved, it is implied that the economized nutriment is turned to some advantageous purpose or other; and to specify that the nutriment is used for the further development of compensating organs, simply changes the indefinite statement of advantage into a definite statement of advantage. There are not two

* While the proof of this article is in hand, I learn that the *Proteus* is not quite blind, and that its eyes have a use. It seems that when the underground streams it inhabits are unusually swollen, some individuals of the species are carried out of the caverns into the open (being then sometimes captured). It is also said that the creature shuns the light; this trait being, I presume, observed when it is in captivity. Now obviously, among individuals carried out into the open, those which remain visible are apt to be carried off by enemies; whereas, those which, appreciating the difference between light and darkness, shelter themselves in dark places, survive. Hence the tendency of natural selection is to prevent the decrease of the eyes beyond that point at which they can distinguish between light and darkness. Thus the apparent anomaly is explained.

† Essays upon Heredity, p. 87.

causes in operation, though the matter is presented as though there were.

But passing over this, let us now represent to ourselves in detail this process which Prof. Weismann thinks will, in thousands of generations, effect the observed reduction of the eyes: the process being that at each successive stage in the decrease, there must take place variations in the size of the eye, some larger, some smaller, than the size previously reached, and that in virtue of the economy, those having the smaller will continually survive and propagate, instead of those having the larger. Properly to appreciate this supposition, we must use figures. To give it every advantage we will assume that there have been only two thousand generations, and we will assume that, instead of being reduced to a rudiment, the eye has disappeared altogether. What amounts of variation shall we suppose? If the idea is that the process has operated uniformly on each generation, the implication is that some advantage has been gained by the individuals having the eyes $\frac{1}{2000}$ less in weight; and this will hardly be contended. Not to put the hypothesis at this disadvantage, let us then imagine that there take place, at long intervals, decreasing variations considerable in amount—say $\frac{1}{20}$, once in a hundred generations. This is an interval almost too long to be assumed; but yet if we assume the successive decrements to occur more frequently, and therefore to be smaller, the amount of each becomes too insignificant. If, seeing the small head, we assume that the eyes of the *Proteus* originally weighed some ten grains each, this would give us, as the amount of the decrement of $\frac{1}{20}$, occurring once in a hundred generations, one grain. Suppose that this eel-shaped amphibian, about a foot long and more than half an inch in diameter, weighs three ounces—a very moderate estimate. In such case the decrement would amount to $\frac{1}{1440}$ of the creature's weight; or, for convenience, let us say that it amounted to $\frac{1}{1000}$, which would allow of the eyes being taken at some fourteen grains each.* To this extent, then, each occasional decrement

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* I find that the eye of a small smelt (the only appropriate small fish obtainable here, St. Leonards) is about $\frac{1}{10}$ of its weight; and since in young fish the eyes are disproportionately large, in the full-grown smelt the eye would be probably not more than $\frac{1}{100}$ of the creature's weight. On turning to highly-finished plates, published by the Bibliographisches Institut of Leipzig, of this perenni-branchiate *Proteus*, and other amphibians, I find that in the nearest ally there represented, the caducibranchiate axolotl, the diameter of the eye, less than half that of the smelt, bears a much smaller ratio to the length of the body; the proportion in the smelt being $\frac{1}{25}$ of the length, and in the axolotl about $\frac{1}{75}$ (the body being also more bulky than that of the smelt). If, then, we take the linear ratio of the eye to body in this amphibian as one half the ratio which the fish presents, it results that the ratio of the mass of the eye to the mass of the body will be but one eighth. So that the weight of the eye of the amphibian will be but $\frac{1}{1000}$ of that of the body. It is

would profit the organism. The economy in weight to a creature having nearly the same specific gravity as its medium, would be infinitesimal. The economy in nutrition of a rudimentary organ, consisting of passive tissues, would also be but nominal. The only appreciable economy would be in the original building up of the creature's structures; and the hypothesis of Weismann implies that the economy of this thousandth part of its weight, by decrease of the eyes, would so benefit the rest of the creature's organization as to give it an appreciably greater chance of survival, and an appreciably greater multiplication of descendants. Does any one accept this inference?

Of course the qualifications of data above set down can be only approximate; but I think no reasonable changes of them can alter the general result. If, instead of supposing the eyes to have disappeared wholly, we recognize them as being in fact rudimentary, the case is made worse. If, instead of two thousand generations, we assume ten thousand generations, which, considering the probably great age of the caverns, would be a far more reasonable assumption than the other, the case is made still worse. And if we assume larger variations—say decreases of one fourth—to occur only at intervals of many hundreds or thousands of generations, which is not a very reasonable assumption, the implied conclusion would still remain indefensible. For an economy of $\frac{1}{200}$ part of the creature's weight could not appreciably affect its survival and the increase of its posterity.

Is it not then, as said above, that the use of the expression, "natural selection," has had seriously perverting effects? Must we not infer that there has been produced in the minds of naturalists, the tacit assumption that it can do what artificial selection does—can pick out and select any small advantageous trait; while it can, in fact, pick out no traits, but can only further the development of traits which, *in marked ways*, increase the general fitness for the conditions of existence? And is it not inferable that, failing to bear in mind the limiting condition, that to become established an advantageous variation must be such as will, other things remaining equal, add to the prosperity of the stirp, many naturalists have been unawares led to espouse an untenable hypothesis?—*Contemporary Review.*

[*To be concluded.*]

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a liberal estimate, therefore, to suppose that its original weight in the *Proteus* was $\frac{1}{1000}$ of that of the body. I may add that any one who glances at the representation of the axolotl, will see that, were the eye to disappear entirely by a single variation, the economy achieved could not have any appreciable physiological effect on the organism.

FREE PLAY IN PHYSICAL EDUCATION.

By M. FERNAND LAGRANGE.

TO all the dangers that threaten the health of the child in existing systems of education, the best and only remedy to oppose is the regular practice of physical exercises. This remedy can, however, be efficacious only provided the exercises are well chosen and applied according to a rational method. Here we meet a serious difficulty in the fact that many persons do not appreciate the importance of the choice of a method, and are hostile to changes in the systems already adopted. "It is contended," once said a university dignitary in our presence, "that our children should take exercise, because hygiene requires it. But what bearing has it on their health to make them march this way and that way, play at the bars, or perform in a trapeze? Select for them the most convenient exercise to apply, and the problem of physical education will be by so much simplified."

In order that the reader may judge intelligently concerning the controverted question of the choice of a method of physical education, it is indispensable to cast at least a rapid glance upon the different forms of usual exercises, and to compare their tendencies and spirit. The immense number of bodily exercises, which it is impossible to describe here or even to enumerate in full, may be referred, if we regard their spirit rather than their details, to two methods—the natural and artificial. Exercises in the former method are inspired by instinct, and demand movements very similar to those which one would execute spontaneously if he were left to himself. The method is called play, and constitutes a kind of regulation of acts to which the human being is naturally inclined. The child, for instance, has a natural inclination to walk, jump, run, and throw whatever he has in his hand, and attention has been turned to give the execution of all these acts a purpose that shall make them interesting.

The other method of exercise, called gymnastics, proceeds in a different way. It is more scientific and systematic than play. It does not start from the observation of the instinctive tendencies of the human being, but from the study of the conformation of his body. It does not say the child is disposed to walk, jump, and throw stones; let us therefore give it opportunity to perform all these acts. But the body is divided into so many articulations and contains so many muscles; let us move each of these joints in turn, bring each of these muscles successively into play, in order that all the constituent parts of the human machine may receive their quota of exercise. Gymnastics proper, basing itself on knowledge of the anatomy of the human body, has devised more or less ingeni-

ous processes for methodically exercising the muscular groups of each region. It has exercises for the arms, for the legs, the trunk, the head, and the pelvis; for the flexor muscles and for the extensors, etc. There are several systems of gymnastics. The Swedish system is characterized by simplicity of movement and moderation in effort. The French system is conceived on the opposite theory of raising the physical aptitudes of the man to the highest point of development. With this purpose it seeks ingenious combinations designed to make each movement represent a difficulty to be conquered; and it contrives expedients for augmenting the effort of the muscles and invents muscular acts to which the man is not naturally inclined.

The natural and artificial methods have very distinct and very characteristic tendencies. The most commonplace example will permit us to show clearly the divergence of their processes. Put a man before a vertical pole and tell him to climb to the top. Left to his instinct, he will utilize all the means of action of which Nature has given him command. He will hug the pole with his arms and legs, and will use his feet and hands. It is the natural process and the easiest one. But if he is a gymnast he will have no use for his legs. He has been taught to climb poles with his hands alone. This is an artificial method to which no one feels naturally disposed, because it increases the difficulty of the movement. Here, then, we find a marked difference between the two methods—one avoids difficulties, the other seeks them.

The essential character of our gymnastics is, therefore, that it demands much more intense muscular effort than the pupil is naturally inclined to, and more difficult movements than his instinctive ones. It tends, for that reason, to make him stronger and more adroit than it was in his nature to become. It is a method of improvement more capable than any other of forming chosen subjects. It has the faults of its qualities; it perfects the man, but at the expense of hard work of which not all men are capable; it may form choice gymnasts, but it forms very few. If it is applied to physical education, we find very few children capable of executing at first, or without long preliminary efforts, the movements which it calls for. Most pupils are discouraged by the difficulties at the beginning, and those who acquire a taste for it are those who are best endowed physically, the strongest, or precisely those who can do best without it. This select minority I admit acquires superior physical capacity, but weak subjects, or those of any medium strength, find no benefit in the gymnastics, for the simple reason that they do not practice it. Repelled by the difficulties of the beginning, they refuse to attempt new efforts and continue in their first impression, which was bad and discouraging. Through all their life they have an aversion to exer-

cise, because exercise was presented to them in the wrong way, under an arid and difficult form.

Thus, our artificial methods of gymnastics are not favorable to the physical education of children, because they are athletic and not hygienic methods. They look especially for strong subjects to make champions of them, when a good hygiene should look for weak subjects to make strong ones of them. We must not forget that the weak form the large majority of the children of the present generation. Our children, so precocious now in their mental development, are far behind in their bodily growth. They need methods of education adapted to their weak physical aptitudes. This is the capital fault of artificial and difficult methods; they do not bring exercise within the reach of children. They are, properly speaking, methods of "selection." They subject children to a sort of trial, taking the strongest to make athletes of them, but leaving the weakest, or the great majority, delivered to all the physical and moral woes that are derived from want of exercise.

It is obvious that difficult exercises can not be recreative. This is still a great reproach to our gymnastics when we undertake to apply it to children subjected to school work, and who have so great need of amusement and distraction in the intervals between their studies. It is not a relaxation that the brain of the child can find in these methodical exercises, but one lesson more added to so many others. Among the movements of our gymnastics, those which are not hard enough to discourage the child by a long apprenticeship are so destitute of interest that they repel by their monotony. Such, for example, are the "floor" exercises. Forty children ranged in three lines wait with erect body and fixed eye the command of the master. Then all together, at his order, turn the head, first to the right, then to the left. They count aloud one, two, three; and, while counting, extend their arms, bend them, raise them, drop them; then the legs have their turn, and finally the trunk and loins. All these motions are very hygienic; but where is there a place for transport and joy in that cold discipline that fixes the features and effaces the smile, in those insipid gestures of which the slightest distraction would destroy the grouping? Yet, to the pupil, pleasure is not only a moral satisfaction, it is a hygienic element indispensable to his health. Under the influence of constraint and weariness the vital functions languish, nutrition is retarded, the nervous centers grow torpid. To impose on a child exercises in which he will find no pleasure is more than a want of solicitude—it is an offense against hygiene.

All methods of physical education must reckon with the necessity of giving some kind of attraction to the movements, even

to the most useful and best-chosen ones. It is interesting, when we travel abroad, to observe the efforts made in different countries to reach this aim of rendering exercise attractive. It is also often curious to notice the ingenuity that is devoted to seeking for singular means of palliating the aridity and monotony of systematic exercises.

The pre-eminently recreative exercise is play. This natural gymnastics brings with it an attraction that animates the most indifferent and gives inspiration to the most phlegmatic. And what a contrast there is between pupils exercising in play and those upon whom a systematic gymnastics is imposed—between English school children, for example, and French! In France, to everybody's sorrow, the children seem to have a horror of motion. Left to themselves, as soon as they are out of the schoolroom, they walk along slowly in couples or gather in groups in the corners of the yard; and they pass the time in chatting, in "philosophizing." Gymnastics is obligatory, it is true, on some days and at certain hours; but a witness of the lesson will be struck with observing that hardly four or five pupils out of thirty execute their exercises conscientiously. The others present themselves in their turn, but hardly outline the movement. The professor incites them, urges them; and they go back to their places after having made an imitation of an effort. In the English colleges no regulation makes exercise obligatory, and every one is free to dispense with it or engage in it at will. But all give themselves up to it with incredible ardor. Weak and strong, young pupils or students twenty years old, all show an equal passion for those plays in the open air, now neglected in France, for which gymnastics has been so unfortunately substituted. To form an idea of the enthusiasm they display one should visit Eton or Harrow, Oxford or Cambridge, and see those immense lawns occupied after lunch by crowds of young men in the costume of the game, dividing into groups, forming into gangs, and organizing their parties without losing a minute. I have still in vision the spectacle of a game of football played in my presence by students of Cambridge. Nowhere else have I ever seen such enthusiasm and such spirit, such disregard of falls and blows. The play of ball as thus practiced might constitute in itself alone a complete means of physical education, so fully does it bring into action all the bodily qualities and all the active moral faculties of the players. What vigor in starting the ball, what agility in getting it and bearing it to the goal! What address also in avoiding the throng of opponents who would bar the passage, and what suppleness in gliding through their arms without losing the precious trophy! And if in the struggle the vanquished champion falls to the ground, we see him rebound like the ball itself, touching the turf and begin-

ning his race more ardently than ever, and forgetting to feel where he was hurt.

This striking contrast between the apathy of French youth and the ardor of English youth is easily explained by the passionate attraction of their games, as compared with the depressing aridity of methodical gymnastics. There is no need of invoking difference of races. In the time when we, too, had our national games French youth were as impassioned with tennis, mall, and barette as the Anglo-Saxons are now with lawn tennis, cricket, and football. But the taste for sport was lost with us from the moment the attempt was made to introduce a more methodical and, as it was believed, more perfect form of exercise. The coincidence will not be denied by any one; but there was more than a coincidence in it—there was a relation of cause and effect. If this is still doubted, it will be enough to refer to the revival of the taste for physical exercises that was manifested all at once in our universities when efforts were made a few years ago to introduce open-air sports; and this taste is becoming so decided that some persons are already apprehensive that the more serious studies may suffer by the diversion of interest from them. To the other qualities of superiority of games over gymnastics is added the fact that they are performed in the open air.

Some advocates of gymnastic athletics bring the objection against plays that, while they furnish attractive and easy exercises, their facility itself proves that they do not require a great expenditure of muscular force, and are not, consequently, serious exercises. To show how slight is the foundation for this objection, let us take an ancient typical French game, tennis, and give a summary analysis of it. Going from a gymnasium, where young athletes have been pulling hundred-pound chest-weights, the sight of a game of tennis will certainly not at first give the impression of a "serious" exercise; and one will, perhaps, be tempted to smile at comparing with the effort of gymnasts that of players chasing a minute projectile of twenty grammes with their rackets. Yet the most rugged man, after an hour of this exercise, will be dripping with perspiration, gasping, and will find himself next morning feeling bent all up. One must try it for himself to realize the expenditure of force called out by this exercise, in which the effort is so little apparent. In the exercise of tennis the work is not limited to the motion of the arm in striking the ball. A well-applied racket-stroke requires the bringing of the whole body into action. In the active chase for the ball all the muscles, from the feet to the head, unite in a common effort, or, as the physiologists say, in a *synergy*, which seems to detach the body from the ground and throw it upon the projectile. The stroke of the racket is a "resultant," or the sum

of a series of partial efforts which are evolved at once in the arm and shoulder, the vertebral column and the thighs; and the stroke of the racket in itself does not represent the whole expenditure of force occasioned by the game. To it should be joined the motions preceding it and preparatory to it, or the player's changes of attitude. All those who have held the racket know how rapidly these motions have to be made. In less than a tenth of a second one must look ahead and up to catch the ball on the fly, or stoop to take it on the bound, or bend to one side to hit it a back stroke. In these rapid changes of attitude the center of gravity of the body is abruptly displaced, and equilibrium can not be preserved without bringing a large number of muscles into energetic play. The muscles of the thorax, the loins, and the pelvis contract and bring the bony parts forming the framework of the body into close action upon one another. The lower limbs, without leaving the ground, also furnish a considerable interior labor, the purpose of which is to assure the player a solid footing, a stability essential to the force of the racket-stroke; and even the feet seem to fasten themselves to the ground, with the assistance of the toes.

Thus, in the game of tennis, the exercise is distributed among a large number of muscles, and this fact enables us to explain how the effects of work may be very much accentuated without our being conscious of having made great efforts. In giving racket-strokes we make infinitely less efforts than in raising heavy chest-weights, yet we do not perform less work in a game of tennis than in a practice of gymnastic athletics.

In all natural movements we use a large number of muscles at once, and we sometimes bring into action those which are very remote from the point where the work appears to be localized. Active games constantly tend to the division of the work among a large number of muscles. This is the consequence of their very character of natural exercises. Being copied from instinctive acts of which they are simply the methodical regulation, they all present the same character of causing the human machine to execute much work without demanding much effort from it. The operation of the motions adopted by gymnastics proper is different. That does not tend, in general, to seek out the associations of muscles, called in physiology *synergies*, but rather to avoid them, with the view of augmenting the effort of the muscles that are brought into play by suppressing the co-operation of the other muscles.

The property of games is, then, to cause the production in the human body of much work without great effort. Now, the hygienic quality of exercise is not effort, but rather work. The more work we do, the more we stimulate the great vital functions,

and, notably, the respiration and the circulation of the blood. But, while work renders these two functions more active, effort, on the contrary, restrains them. By a mechanism we can not study here all intense effort reacts upon the lungs, the heart, and the large blood-vessels. When we try to raise a heavy weight, or to break between our hands a stick that offers a strong resistance, we feel the muscles of the breast and the abdomen hardening and violently compressing the lungs, as well as the heart and the large blood-vessels. Respiration is suspended, the blood flows back toward the veins, and we see them swelling on the neck and forehead. This violent pressure is not always without danger.

We have selected tennis, the most celebrated and the most French of games, as the type of our demonstration. All games in which projectiles are thrown, or the ground is skipped over, are but variants of tennis, and conclusions drawn from it are valid also as to them.

There are numerous other simple and easy games which are none the less hygienic. The most elementary of all, the game of tag, which children improvise as if by instinct—as also do young animals—is not less efficacious than the most elaborate sports to stimulate respiration and the circulation of the blood. It is because these games represent, in the aggregate, much work. At each step in running, the child takes from the ground and lifts to a certain height above it a relatively considerable weight, that of the body. Now, we know that work in mechanics is estimated by multiplying the weight of the mass raised by the height to which it is lifted. Though the body is lifted only a little at each step in running, yet as these steps are renewed as often as four or even six times a second, we see what number of kilogrammetres a game of tag a quarter of an hour in length may represent. This considerable work is accomplished without effort, because the legs, the thighs, and the pelvis, which co-operate in executing it, are re-enforced by the strongest muscular masses of the body. But while the "effort" passes unperceived by the muscles in the running child, the "work" makes its general effects plainly felt in the organism. The least attentive observer has remarked how running accelerates the circulation of the blood, and especially how it stimulates respiration and magnifies the heaving of the ribs, which is the essential cause of the bellows movement which draws the air into the chest. We might say that in the running child the organ that works most is just the one that it is most important to develop, the lung.

It would be superfluous to pursue the analysis further. We have seen that games, although attractive and easy, are not less serious exercises than our methodical analysis, and that they

are in every respect agreeable to the hygienic exigencies of children.

These conclusions, we know, will raise numerous protests, both from specialists whose convictions they may wound and whose interests they may conflict with, and among amateurs of gymnastics to whom those exercises are dear, because they are agreeable to their abilities and tastes. They are, on the other hand, in harmony with the opinion of the most eminent men who have occupied themselves with education, hygiene, and physiology. Herbert Spencer gives preference, among all the methods of physical exercise, to "free play"; and M. Marey, in his report on the work of the Commission of Gymnastics, of which he is president, points out to the Minister of Public Instruction the inconveniences of gymnastics, which is, in his opinion, "only a makeshift to be kept up till the time when we can find a practicable means of substituting exercises really adapted to the abilities and hygienic needs of the child—that is, open-air games."

It is, however, very far from our thought to suggest that methodical gymnastics should be wholly discontinued. That form of exercise, which is not adapted to children or to very young persons, is excellent for those who have completed their growth, and who have time and taste for developing their muscles to the extreme. Gymnastics is an excellent preparation for the military service, and may be of great aid to those who desire to harden themselves by training to the life of the regiment. But it is early enough to begin it in the eighteenth year—that is, after school studies are over.

In short, artificial and difficult exercises are to natural exercises what, in mental education, the higher instruction is to primary and secondary instruction. Physical education has its "grades" as well as mental education, and we commit an error when we reverse them.—*Translated for The Popular Science Monthly from the Revue des Deux Mondes.*

THE Abors, of Burma, have great faith in pig's liver as an oracle. Colonel Dalton, of the English East Indian service, says that, finding that some members of the tribe desired to ascertain by this test the reason of his visiting them, he suggested that a simple plan would be to judge by his words and looks; to which they retorted that the words and faces of men were fallacious, but pig's liver never deceived them.

"BOG BUTTER" was the subject of a recent paper by the Rev. J. O'Laverty before the Royal Society of Antiquaries in London. The author said that a roll in his possession found at the depth of twelve feet in a bog, wrapped in a coarse cloth still retaining the print of fingers, had a taste of cheese. The property of bog-burying conveying a cheesy flavor to butter, or making it rancid, has been mentioned by other writers, and is referred to in an old couplet.

CONSERVATION OF THE MACKEREL SUPPLY.

By ROBERT F. WALSH.

DURING the past few years there has been a serious scarcity of mackerel off the northern Atlantic coast, or rather the fishermen have been unable to capture such large numbers of this fish as had been their custom in former years. This falling off in the mackerel "catch" has a marked effect upon the fish-food supply of our markets. Scarcity of any commodity tends to increase the prices of articles which are used for similar purposes; hence, not only has mackerel become a fish of luxury—because of its scarcity—but the prices of most other fishes have been advanced correlatively with the decrease in the general fish supply caused by the partial failure of the mackerel fishing during the past few years.

Recognizing this, the United States Fishery Commissioners inquired into the subject, but arrived at no definite conclusions, either with regard to the causes of this scarcity of mackerel, or as to how the supply could be increased to the former standard. However, some enterprising owners of fishing schooners having a knowledge of the enormous "banks" of mackerel that frequent the southern Irish coast at certain seasons, equipped their vessels for the ocean voyage and sent them across the Atlantic to fish for mackerel in Irish waters. In the matter of capturing large quantities of fish—superior to that which is caught in the western Atlantic—they were successful; but the question is undecided as to whether or not a continuance of the experiment would be financially judicious.

To my mind it seems clear that the sending of vessels to the Irish coast to capture fish for this market could not be profitably continued; but I believe that I can point out, not only the causes which led to the failure of the mackerel fishing upon this coast, but also show—from practical observation of the habits of mackerel and the methods of fishing for them—how the supply off the northern Atlantic coast could be readmitted.

The solution of such a problem as this can not be arrived at by any theoretical examination of the question. Study of the habits of the fishes, through centuries, and practical observation of their movements and instincts, can alone guide one in arriving at satisfactory conclusions. And, in order that my statements may receive due consideration, I think it not unwise to premise that at the Fisheries Exhibition in London, in 1883, I read a paper upon this subject before a special International Conference, and was awarded for it one of the few "grand diplomas of honor" which were conferred by the "commissioners appointed by her Majesty's Government."

I shall elucidate the subject of the causes of the apparent diminution in the mackerel supply off this coast by an example which will *de facto* point out how this fish can be readmitted as an economic sea product for our food supply; and in so doing I shall draw almost entirely from my research in the matter as contained in the paper to which I have referred.

About thirty years ago the mackerel fishery off the southern Irish coast was first (in this century) prosecuted as a great industry. Fishing vessels came there from Scotland, England, the Isle of Man, and from France, to reap the silvery harvest of the ocean; and the few rude native craft which then existed were rapidly multiplied into hundreds of beautiful yacht-like fishing vessels. For twenty years the mackerel fishing—which begins in March and continues until the end of June—prospered almost phenomenally, and many of the boat-owners and fishermen, both native and foreign, amassed comparative wealth, as did also the ship-builders and net and rope makers. The town of Kinsale, county of Cork, which is the headquarters of the industry, enjoyed a prosperity during those years strangely at variance with the decaying condition of other Irish towns; but in 1880 this great fishery was temporarily destroyed, through sheer ignorance of the habits and instincts of the mackerel, by the avarice of the boat-owners and fishermen of the Isle of Man.

It occurred in this way: All the fishermen of this great fleet —over one thousand fishing vessels, each carrying eight to ten men and more than two miles of netting—were aware that the mackerel came from the Atlantic, in the southwest and west, toward their spawning ground off the southern Irish coast at this season. But the Manx fishermen and owners were not satisfied with reaping a good harvest from March to June. The fish fetches a much larger price early in the season, and they decided that they would "try" for them farther west than the usual fishing ground, before the season opened off Kinsale and Baltimore. The result was disastrous. For two years the "early boats" succeeded well; but in the third year the entire mackerel fishing along the coast was a failure, and it was not until May and early in June that good catches were made off the "grounds" outside Kinsale. Then the price was low, as the fish was too full of roe, or "spent" after spawning, to be shipped to foreign markets in good condition, and one after another the boat-owners and fishermen and merchants fell before the unprosperous wave. The fact of the mackerel not turning up until late in the season caused sore distress among the eight or ten thousand persons engaged in the industry; but it had one good effect—it stopped the too early fishing; and now, after eight years of failure, prosperity is again beginning to dawn upon the southern Irish fisheries.

It must be obvious to the most ordinary reader that the cause which led to this temporary failure was the too early interception of the mackerel while on the way to their spawning ground. Why this should be, I shall explain more interestingly; for in elucidating the subject I shall have to call attention to the peculiar habits and instincts of the mackerel, which, upon the authority of early official documents, we learn were suspected, if not known, by the fishermen of the south of Ireland more than two centuries ago.

When alluding to the instinct of the mackerel I did so in a manner that might possibly lead a reader to suppose that they possess the same unreasoning prompting to action that do all animals, whether it be that that instinct warns them of danger, safety, or the presence or propinquity of food or pleasurable object. But there is one all-important factor of common instinct which is *partially* absent in the mackerel—viz., danger; for, although when they are interrupted on the way to their spawning ground they avoid the place where their shoals were broken—oftentimes for many years—and execute the arc of a circle around the danger spot on their succeeding journeys to the spawning ground, it is a most curious fact that when close to their haunts they swim blindly and without any apparent unreasoning prompting or instinct of danger onward, nor do they struggle to free themselves from the meshes of the net as do all other fishes.

There can be no doubt whatever about this absence, or rather partial absence, of the instinct of danger in the mackerel.

Another peculiar trait of this member of the *Salmonidæ* family is that mackerel do not feed upon their own young as do most other fishes; and often, in the autumn, when the "harvest mackerel" (a smaller species than the "season" mackerel, and usually, but erroneously, supposed to be all males) frequents the waters close to the shore, I have seen them rush wildly through a shoal of sprats or brit, with which young mackerel often swim, devouring them upon all sides, but studiously avoiding those of their own family. Indeed, the *petite* mackerelettes do not seem to be at all so alarmed as their companions, who spring out of the water in their terror and swim scatteringly in every direction. This, too, is undoubtedly instinct upon the part of both the juvenile mackerel and his larger brother. But that fact does not importantly concern the purpose of this article.

I have shown that they possess instinct of both a perfect and imperfect order, and I have proved that, because of the interception of the shoals while on their way to the spawning ground in the spring, they abandon their usual course and travel perhaps hundreds of miles in a semicircle to reach the haunts where the roe is deposited. Of course, I have given only one example, and

that one which came under my own observation during the years from 1880 to 1892; but I shall now go back more than two hundred years and add to my personal knowledge the experience of the fishermen of that time, as recorded in the Annals of Kinsale, which old manuscripts I had the very great pleasure and privilege of being allowed to make a thorough examination of in 1882 and 1883.

Even in recent years, here, as well as in Ireland, the fish *savants* sought to place the cause of the scarcity of mackerel at every door but the correct one. One man would say, "They are being overfished"; another, "They are most uncertain in their comings and goings, and have no fixed or permanent haunts or spawning grounds"; and yet a third would advance the *theory* (for, mind you, all these men are simply theorists in the science of ichthyology) that "mackerel only frequent certain localities on the coast at irregular periods."

All three theories are wrong; and I shall prove that not only have they fixed spawning grounds and haunts, but that they have been known to frequent one "ground" for over two hundred years without the intermission of a season, and that it is only such accident as continued interception of their progress toward that ground *too early in the season* that prevents their being captured in large quantities in the same places and at the same time every year.

Early in the seventeenth century "enormous catches of pilchards, mackerel, and herring" were obtained off the southern Irish coast. At that time the mackerel season occurred precisely at the same time in each year as it does now, and the great spawning grounds were located then in exactly the same place as they are to-day. This of itself goes far to prove that the habits of mackerel, in this wise at all events, are practically unchangeable; but we must advance more particularly into the matter to arrive at a positive rock foundation for my statements. In the seventeenth century the native fishermen fished in open boats, "with rude and inadequate appliances." But then, too, a fleet of French fishing smacks came annually from Dieppe, Havre, Boulogne, and the many small villages and towns lying between these cities, to reap the mackerel harvest in the ocean outside Kinsale. These Frenchmen had fishing appliances much superior to those of the Irish. In fact, I demonstrated clearly in 1883 that the most improved modern inventions for the capture of mackerel are not importantly superior to the gear used by the French fishermen in Irish waters nearly three hundred years ago. And it is in this connection that the connecting link between the mackerel fisheries or mackerel habits and instincts of the seventeenth and nineteenth centuries can be plainly demonstrated.

In September, 1675, the fishermen of Kinsale, smarting under the continued absence of mackerel "from their shore . . . until the harvest time" for two seasons, held a meeting at which it was concluded and resolved that "the enormous nets of the Frenchmen" broke the shoals "and the mackerel became frightened and sought other grounds." Thereupon they petitioned the king, through Secretary Burchard, . . . that "a fleet of three hundred sail of French have for many months, in this season, beleaguered our coast. They have nets, each of them half a league in length. And they fish *four* OUR mackerel and pilchards to such a degree that our nets can not catch any more." The petition then goes on to state that "in consequence of the great length of the nets" (of the Frenchmen) "the shoals are broken and the mackerel refuse to come again in that way." This petition was drawn up and signed in Kinsale in September, 1675, and it goes to prove that so far back as the seventeenth century the mackerel frequented the same "grounds" that they do to-day; and that for the same reason as they did in 1883, they resented the interference of the Frenchmen at a too early period in their migration toward the spawning ground and disappeared from the coast *at this point.* That they were captured late in the season is told in the following quotation, dated September 7, 1675: "Notwithstanding that the mackerel disappeared from this coast in the spring, because of the depredations of the French, they have turned up again in enormous numbers and fat at their old haunts outside the Old Head to the westward."

This proves my original statement that mackerel have a distinct and permanent spawning ground; and it is a strong weapon in my assertion that want of knowledge of the habits of the fish is solely responsible for its scarcity either in this or in the Irish market.

But it is needless to prolong this argument. It is established without question that the habits and instincts of mackerel are the same that they were three hundred years ago, and that during all these years they sought the same spawning grounds and resented interference with their progress toward them by making a detour. In this detour lies the secret of the erroneous idea that "the mackerel are leaving the coast." They are not. They will reach their spawning grounds, no matter how far they swim; and, when they are near to them, nets, of whatever construction, can not deter their progress.

The moral of this is simple. To me it is as plain as the sun at noon. It is this: If we wish to capture mackerel, we must do it in season. Nature sends them to us then, and we should profit by their approach; but we must not use unnatural methods or times to reap the harvest.

And now let us examine more particularly the bearing which this elucidation of the habits of the mackerel in the eastern Atlantic has upon the waning mackerel fisheries of the eastern American seaboard. Unfortunately, we have not the same specific data which are furnished in the Annals of Kinsale to compare the earlier conditions. In fact, we have no authentic records of mackerel fishing with nets earlier than the first decade of this century; and, as says Mr. R. Edward Earll, in his exhaustive report, it was not until 1826 that the New England mackerel fisheries were prosecuted with any appreciable success. Prof. Brown Goode and Captain Collins, of Gloucester, have also added most important contributions to the history of the mackerel off this coast; and, as all these efforts are contained in the official reports of the United States Commissioners of Fish and Fisheries, I shall confine my own observations within the limits of the official records of their research. The mackerel fishery off the New England coast extends from the northern end of the Gulf of Maine to Cape Cod, and it has been ascertained that their spawning ground lies between the Shoals of Nantucket and the Bay of Fundy. A general fishing, however, is carried on from the shoals southward as far as the Chesapeake Bay. Mackerel were first fished for in these waters off the New England coast; and when, in 1870, the older appliances were discarded by the majority of the fishermen and the purse-seine adopted, enormous numbers were captured by the men who fished outside Gloucester. Discovering, however, that the fish could be captured earlier in the season farther south, the more enterprising among the fishermen tried the waters as far south as the Chesapeake and Delaware Bays, and succeeded admirably for several seasons. Then, in 1878, the men who remained on the New England ground, and who continued to use the old appliances—drag and gill nets—discovered that the supply of mackerel was becoming irregular and smaller, and, believing that this scarcity and irregularity of the fish were caused by the use of the purse-seine, they protested against the use of that style of net in precisely the same manner as did the Irish fishermen petition against the "long nets of the French" in 1675.

The protest of the Gloucester men had no effect; the Southern fishery was continued uninterruptedly for several seasons more, and finally the mackerel seemed to have disappeared from the coast in the same manner as they did from the Irish coast from 1883 to 1892 during the spring season; and in the same manner also they reappear off their New England spawning grounds in the late summer. I omitted to state that the season mackerel is caught in American waters in the same months that they are in season off the Irish coast, viz., March to June.

From this simple statement of the history of the New England and northern Atlantic mackerel fisheries, I believe that the most obtuse reader will deduct the fact that the apparent disappearance of that fish from our coast is solely due to the same causes which were observed and which I have explained concerning the Irish mackerel fisheries; and I believe, and I think it is apparent from what I have written, that, in order to conserve a bountiful supply of mackerel in these waters, they should not be intercepted on their way toward their spawning grounds, certainly not until they begin to appear off the Shoals of Nantucket.

The analogy between the errors of the fishermen and the habits and instincts of the mackerel, upon both sides of the Atlantic, will be seen to be curiously coincidental; and to my mind it seems clear that similar precautions would surely bring about similar results.

It is a clear case of judgment and patience. I should probably have said want of judgment; for want of judgment, seasoned by avarice, is the sole cause of the apparent disappearance of mackerel from this coast. The habits and instincts of the mackerel are practically unchangeable; and if our fishermen only study a little more the habits of the fishes, and accustom their expeditions to the necessities compelled by these natural sequences, our food supply—in the matter of mackerel or other fish—will not measurably diminish.

TRACES OF A VANISHED INDUSTRY.

By JOHN GIFFORD.

A LINE drawn across New Jersey from Long Branch to Salem separates a peculiar peninsula known as "South Jersey." This rudely triangular region is bounded by the ocean, Delaware Bay and River, and the rich farm lands on the outcrops of the marl-beds.

This territory is slightly undulating, little cultivated, and sparsely inhabited. There are sandy parts covered with pitch pines. Being unfit for cultivation, this should be left in forest, to regulate the climate and hold the sand in place. The pines are pioneers. They prepare the soil for other plants, and when cut are quickly replaced by oaks and other trees. There are loamy and gravelly parts worthy of careful cultivation, yielding excellent fruits and vegetables.

There are low, boggy sections, in which flourish cedars, magnolias, maples, mistletoe-stunted gums, and the like. Many of these lowlands are fit for meadows and berry bogs. A striking feature of this region are the dark and dense swamps of white cedar. The

tree is tall, straight, and sharp-pointed, yielding a soft, white, durable wood. In the humus of the swamp, which is often several feet in thickness, one tree supports another, and, if a few are cut, others fall in every direction. An old cedar-swamp bottom, through which there is a running stream, is usually selected for a cranberry bog. Many acres of swamp land are covered with huckleberries in plenty and of fine quality. There are bushy, semi-marshy areas, with here and there a straggling pine. In such places many rare and beautiful plants, for which the region is famous, are found, and, in spite of the flies and mosquitoes, they have long been a favorite resort of enthusiastic botanists.

There are also the salt marshes, called "mashes" by the haymen and baymen, extending for many miles along the coast and bays, the rich black soil of which may some day be drained and tilled. It freshens when banked and sluiced. These marshes, endless to the eye, are intersected by many bays, salt-ponds, thoroughfares, and winding creeks, bordered with rustling reeds, resounding with the twitterings of many meadow-wrens, the cacklings of mud-hens, and cries of many birds of the snipe order. They are aglow in season with pink, white, and yellow flowers, and flecked at times with the sails of boats moving in the creeks and bays. These meadows yield thousands of tons of salt and black grass, which is still in many places cut with the scythe and carried by two men with "hand poles" to the square, clumsy scows which are partly rowed and partly drifted to the landings.

Many miles of salt meadow separate the mainland from the narrow strips of sand beach bordering the sea, the white glimmering sands of which, covered in places with large hollies and red cedars, are washed hither and thither by the waves and piled by the winds in dunes. These beaches, on which are located the famous seashore resorts to which thousands flock for recreation, are separated by many inlets, through which the tides sweep swiftly.

Here and there are the gray, unsightly boles of trees which have been killed, and whole strips of woods blasted and blackened by fires which rage at times in these regions.

Few spots are favored with more rivers and streams along which the scenery is wilder. Their waters are yellowish-red in color at first, but become black later, owing to changes in the peaty matter which they contain. Years ago these streams were dammed, to supply the power with which to move the clumsy, old-fashioned bellows to pump air into the furnaces in the manufacture of iron from "bog ore."

The sand of the hills of South Jersey is yellowish in color, because of the iron which it contains. When firmly cemented together by large quantities of iron compounds, a durable ferrugi-

nous sandstone or conglomerate is formed, which is the principal building stone of the region. In contact with decomposing organic materials, ferric oxide, the insoluble reddish coloring matter in the hills, is reduced to ferrous oxide, which combines with carbonic acid to form a carbonate of iron, which is soluble in water containing an excess of carbonic acid. Thus it is carried by the water to the bogs, where the carbonic-acid gas is exchanged for oxygen and the iron is precipitated in the form of ferric oxide; but, if there is a large quantity of decomposing peat present, it is deposited in the form of ferrous carbonate. Thus the so-called "bog iron ore" is formed.

The "raising" of this ore and the manufacture of iron therefrom was the leading industry of South Jersey during the early part of this century. Charcoal was the fuel used and coalings were common throughout the "Pines." An active coaling is now seldom seen. Shells were hauled by wagon or rowed and poled by scow from the seashore for a flux, the oyster then being of more value for that purpose than for food. Better oysters could be picked from those shell heaps than can be bought at the stands to-day. In a memorandum kept by the "master ore-raiser" for one of the largest furnaces there are many interesting notices of large quantities of clams and rum bought and sold, but the oyster is never mentioned. These account-books were decorated with the pictures of soldiers and warships, showing well the prevailing thought of those days.

There was then an extensive trade between South Jersey and the West Indies, exchanging lumber and iron for rum, sugar, and molasses, in spite of the pirates who were ever at home in the thoroughfares, bays, and crooked channels of the coast. Scattered here and there along these streams are the remains of what were once centers of a flourishing industry. In some places the furnaces and forges have been completely obliterated and forgotten; in others only bits of black slag remain; while in others the ruins are still standing. At the head of the Tuckahoe River there is a crumbling stack, at Allaire there are ruins, and at Weymouth the course of a canal may be traced by which the ore was brought to the furnace from the bog.

The places were connected by stage routes, along which at regular intervals were the famous "jug taverns" of old, the ruins of which in many localities may still be seen. They are now in the midst of the forest, and, like the remains of the forges and furnaces, are sad reminders of more prosperous days. To-day one may wander for miles along these old overgrown roads without seeing a single human habitation.

In 1766 a furnace was built at Batsto, one of the first and at one time the largest in this country. Batsto is in the heart of the

"Pines," at the head of Mullica River. Battles were fought at Chestnut Neck near the mouth of this river, at one time a large and prominent settlement, and cannon balls, old pennies, and pebbles oddly decorated on one side have been found on the beach. Skeletons of men have been bared by the winds, which some think are those of soldiers and others of Indians, since it was once an Indian village, as is indicated by potsherds, broken shells, flints, and other signs scattered all over the surface of the ground. Munitions of war were cast there for the Revolution. General Greene himself owned a twelfth interest in the Batsto furnace, but sold out his share when he entered the army.

Extending northward from the Mullica River are the "Plains," a desolate region inhabited at one time, they say, by wild hogs, pine robbers, and pirates.

Weymouth was another important place. Materials were forged there for the War of 1812, and street lamps standing today in Philadelphia and waterways in Mobile were molded there.

Scattered here and there throughout the "Pines" were active, thriving "bloomeries." Now all is silence, save for the noises of the woods. Instead of the buzz of the mill and the commotion of men at work, there can now be heard only the chirping of insects and the song of the cheewink by day and the croaking of toads and frogs at night. The ruins of forges and furnaces, the large, dilapidated houses, the overgrown roads, the wharves, the sluices, the piers, the old fences, and the masses of black coal-dirt on the landings where vessels once came for wood and charcoal, are all evidences of what the country was when iron was made from "bog ore." In the houses and ample barns even of more recent date the spiders have woven their webs, the wasps have mudded the walls, and the rats scamper at home through the deserted rooms. Many orchards are untrimmed and sterile, many meadows flooded, and many fields overgrown with briers and Indian grass.

After the death of the iron manufacture South Jersey passed into another industrial stage—the making of glass. The glory of this industry is also passing, and ruins of old factories are not uncommon.

Those furnaces and forges mark the infancy of the iron industry in America—an industry which has made this century "the age of iron." Its local decline was natural and unavoidable—due to an inadequate supply of ore, a crude manner of manufacture, and difficult means of transportation.

ERNEST RENAN.

SKETCH OF HIS LIFE AND WORK.

By GABRIEL MONOD.*

NOTHING could be simpler, or more of a piece, than the life of Ernest Renan. Study, teaching, and the joys of family life are its whole fabric, and fill it from end to end. For diversions, a little travel and the pleasures of conversation—friendly dinners, and a few frequented *salons*. Twice, indeed—urged by the thought that a man of his standing owed something of his time and strength to the public service—he solicited the popular vote: once in 1869, as deputy for the Seine and Marne; and again in 1876, as senator for the Bouches du Rhône. But he carried into these electoral contests no trace of the fever of ambition, and when he saw that he was not likely to command a spontaneous majority he retired from the field without vexation and without regret.

He was a native of Tréguier (Côtes du Nord), one of those ancient episcopal cities of Brittany which have retained their ecclesiastical character even down to our own time. The humble house is still to be seen, close under the great cathedral founded by St. Yves, where Renan was born on the 27th of February, 1823, and the little garden, planted with fruit trees, where he played when quite a child, letting his eyes wander over the still and sad horizon of the hills which skirt the river bank. His father—a captain in the merchant navy, who also carried on a small trade—was of ancient Breton descent, the name of Renan being that of one of the oldest of the Armorican saints. He transmitted to his son the dreamy imaginative nature and the disinterested simplicity of his race. His mother was of Lannion, a little commercial town which has nothing of the monastic look of Tréguier. Pious as she was, she had an elasticity and joyousness of nature which her son inherited from her, and which he attributed to her Gascon origin. Renan has too often insisted on the co-existence of the two natures in himself—the Breton seriousness and the Gascon vivacity—for us to venture to contradict him on this point; but the serious side of him was first and last and strongest in all he wrote, or did, or thought.

For the rest, life began for him austerely, and more than austerely; it was hard and painful. While he was yet a child, his father was lost at sea; and it was only by the most self-denying economy that his mother could provide for the education of her

* From his article in the Contemporary Review.

three children. But Renan had no grudge against his destiny for giving him these years of privation; he was grateful for having been brought up in the knowledge and love of poverty. All his life he loved the poor, the humble, the common people. He never turned his back on the lowly relatives he had left in Brittany. Down to the last years of his life he loved to visit them; and it is characteristic of him that he kept the little home of his childhood just as it was. His sister Henrietta, twelve years his senior—a woman as remarkable for her force of mind and character as for her passionate tenderness of heart—worked hard for her family, giving lessons first in Tréguier, then at a school in Paris, then in Poland, and all the while watching with a sort of motherly solicitude the progress of this young brother, whose gifts she had already recognized. Young Ernest was meanwhile doing his "humanities" under the good priests in the seminary at Tréguier—a gentle and studious scholar, carrying off all the first prizes as a matter of course, and seeing before him no larger future than that of a simple and learned priest among his own people, with perhaps, at last, a canonry in some cathedral. But it so happened that his sister had met in Paris a young, brilliant, and ambitious abbé, M. Dupanloup, who had just been appointed head of the seminary of Saint Nicolas du Chardonnet, and who was looking out for clever recruits. She spoke to him of her brother; and the result was that, at fifteen and a half years old, Ernest Renan found himself transplanted to Paris, where he astonished his new masters by his marvelous facility of acquisition and the early maturity of his mind, and, after passing through his course of philosophy in the seminary of Issy, was entered at Saint Sulpice for his theology. Saint Sulpice was then the only seminary in France which kept up the tradition of the severer studies, and which, in particular, taught the Oriental languages. Its teachers—especially the eminent Orientalist, Father Le Hir—recalled, by the austerity of their life and the profundity of their learning, the great scholars of the Church in the seventeenth and eighteenth centuries. Renan rapidly became the friend, and then the rival, of his masters, who discerned in him one of the future glories of their house, and little guessed that the very lessons he received there were to separate him from it forever.

The crisis, when it came, was a purely intellectual crisis. By training him in comparative philology and criticism, and by encouraging the scrutiny of the sacred writings, the priests of Saint Sulpice had placed in the hands of their young disciple the most formidable instrument of negation. His quick intelligence, lucid, penetrating, and sincere, perceived at once the weakness of the theological structure on which rests the whole weight of Catholic doctrine. All that he had learned at Issy of natural science and

philosophy served to re-enforce the doubts inspired by historical and linguistic criticism as to the infallibility of the Church and the Scriptures, and the teaching which makes the Christian revelation the central fact of history and the explanation of the universe. It was a heart-breaking process, since it was to carry disappointment and dismay, not only to the teachers he venerated but to a mother whom he tenderly loved; but he did not hesitate for a moment to take the step imposed upon him by honesty and conscience. He left the peaceful asylum which had held out to him the promise of an assured future, for the hard life of an assistant schoolmaster in the Quartier Latin, and began, at twenty-two, to prepare for the examinations necessary to his entering on the career of a professor. At this difficult juncture his sister came to his aid. Her own thoughts and her own studies had already brought her to the same negative views with regard to the Catholic religion, though she had steadily avoided unsettling her brother's mind with her doubts; and when he opened his heart to her, and told her his reasons for quitting the seminary and renouncing the priesthood, she received the news with joy, and sent him her savings—some twelve hundred francs—to help him over his first difficulties.

But he had no need to exhaust this reserve fund. With his extraordinary powers and the knowledge he had already acquired, he soon made himself an independent position, and henceforth he went on from one success to another. The record of his achievements during the five years which followed his withdrawal from Saint Sulpice (1846–1850) is simply astounding. He passed through all his university degrees, from the B. A. to the "agrégation" in philosophy, where he took a first in 1848; he took the Volney prize the same year at the Académie des Inscriptions for an important work on the general history and comparative grammar of the Semitic languages, and another prize two years later for an essay on the study of Greek in the middle ages; he made a tour of research among the Italian libraries, whence he brought back his *thèse de doctorat*—a book on Averrhoes and Averrhoism, which contains an admirable history of the introduction of Greek philosophy into the West by the Arabs; and at the same time he published an essay on the origin of language, and composed a considerable work on the Future of Science, which was not published till 1890.

This book, written in the space of a few months by a young man of twenty-five, already embodies all the ideas on life and the world which he elaborated in detail in his later writings; but they are here affirmed in a tone of enthusiastic conviction which became more and more modified as he went on, though the basis of his teaching remained unchanged. He hails the dawn of a new

era, in which the scientific conception of the universe shall take the place of the metaphysical and theological. Natural science, and especially the historical and philological sciences, are to be not only the liberators of the human mind, but also the guides of human life. Politics, ethics, education—all are to be regenerated by science. Science is to establish the reign of justice among men, and to become the source and final form of religion.

It was by the advice of Augustin Thierry and M. de Sacy that Renan suppressed this volume, in the fear that its hard and dogmatic tone might repel the reader, and that its ideas would prove too new and too daring to be accepted all at once. Besides, Augustin Thierry was uneasy at seeing his young friend ready to give away at a stroke his whole intellectual capital. He persuaded him to dispense it in detail in the Revue des Deux Mondes and the Journal des Débats. And thus it was that Renan became the first of our essayists, giving currency to his most audacious conceptions, and to all the discoveries of comparative philology and rationalistic exegesis, under the light, easy, and accessible form of literary and philosophic criticism. They were republished in the volumes entitled Moral and Critical Essays, Studies in Religious History, and New Studies in Religious History. His literary fame grew fast, while his learned works obtained for him, in 1856, at the age of thirty-three, the membership of the Académie des Inscriptions.

From the year 1851 onward he was attached to the Bibliothèque Nationale; and this modest post, together with the growing income derived from his works, had enabled him to marry. This marriage had very nearly been the occasion of another dramatic episode in his private life. He had lived, since 1850, with his sister Henrietta; their fellowship of thought and feeling had grown with their fellowship in life and work; and Henrietta—who supposed that in abandoning the Church for science her brother had but exchanged one priesthood for another—had never dreamed that anything could separate them. When he told her of his intended marriage, she betrayed such acute distress that he determined to renounce the project which caused her so much unhappiness; and it was Henrietta herself who flew to Mlle. Scheffer and entreated her not to give up her brother, and Henrietta who hurried on the marriage, the mere idea of which had been too much for her self-control. The marriage did not, after all, involve her separation from her brother. She attached herself passionately to his children; and when he and his wife made a journey to Phœnicia on an archæological mission she accompanied them, and stayed with her brother when Madame Renan was obliged to return home. These few months of dual life were her last happiness. They were both attacked by fever at Beyrout.

She died, while he, prostrated by the malady, was too ill to realize his loss. In the little biographical sketch, which is his most exquisite work, and one of the purest masterpieces of French prose, he has given her portrait to posterity and made us share his loss.

He brought back from Syria not only the inscriptions and archæological observations published in his Phœnician Mission, which appeared in numbers from 1863 to 1874, but also the first sketch of his Vie de Jésus, which forms the first volume of the great work of his life, L'Histoire des Origines du Christianisme, in seven octavo volumes. The religious questions had always seemed to him the vital questions of history, and the ones which most needed the application of the two essential qualities of the historian—critical acumen, and that divination of the imagination which resuscitates the men and civilizations of the past. It was upon Christianity, the greatest religious phenomenon of the world, that Renan turned the whole resources of his erudition, of his poetic insight, and artistic skill. He was afterward to complete the work by adding to it, by way of introduction, a History of Israel, of which three volumes have been already published, and the remaining two are finished and ready for the press.

The appearance of the Vie de Jésus was not only a literary event but a social and religious fact of vast import. It was the first time that the Life of Christ had been written from a purely laical point of view and apart from any supernatural conceptions, in a book destined not for doctors and theologians but for the general public. In spite of the infinite delicacy with which Renan presented his idea, the softened and reverent tone in which he speaks of Christ—or, possibly, even on account of that delicacy and reverence—the scandal of it was colossal. The Catholic clergy felt at once that this form of incredulity, expressing itself with all the gravity of science and all the unction of piety, was far more formidable than the flippancy of Voltairianism; and coming, as it did, from a pupil of the ecclesiastical schools, the sacrilege and the heresy were complicated with treason and apostacy. The Imperial Government, which in 1862 had nominated him Professor of Semitic Philology in the Collége de France, had the cowardice to revoke the nomination in 1863 in deference to the clamor set up in the clerical camp, but innocently offered him, by way of compensation, a curator's post at the Bibliothèque Nationale. "Pecunia tua tecum sit" (thy money be with thee) was Renan's reply to the minister who offered it; and freed henceforth, by the extraordinary success of his book, from material cares, the "European blasphemer," as Pius IX called him, went quietly on with his work. It was not till after the fall of the empire, in 1870, that his chair was given back to him. Not only did he occupy it thenceforward till his death, but he became in

1883 the honored head of the great scientific establishment from which he had once been driven with indignity.

Forced, by the publication of the Vie de Jésus, into the arena of religious conflict, Renan never stooped to polemics. He kept the quiet of his thoughts, untouched by all this wrangling; and he continued to speak of Christianity and the Catholic Church with the same even fairness—I may say more, with the same respectful though independent sympathy. The English public had an opportunity of appreciating these high qualities of intellectual liberty and calm when, in 1880, he gave his Hibbert lectures on Rome and Christianity, and another admirable lecture on Marcus Aurelius, at the Royal Institution—a lecture in which he anticipated the generalization of the last and finest volume of his Origines du Christianisme.

The year 1870 marks an important epoch in the life of Renan. It was, indeed, the year of a new crisis. From the moment when he emancipated himself from his first foster-mother, the Church, and from his ecclesiastical education, Germany had been the second foster-mother of his mind. As he had broken with the Church without ceasing to recognize her greatness and the services she had rendered, and still renders, to the world, so now he suffered, not without pain, the relaxation—almost the rupture—of the moral ties which bound him to Germany; but he never repudiated the debt of gratitude he owed her, nor ever sought to depreciate her virtues and her merits. He gives eloquent expression to his feelings in his letters to Dr. Strauss in 1871, in his speech on his reception into the French Academy, and in his letter to a German friend in 1878. At the same time a new development took place in his political conceptions. An aristocrat by temperament, and a constitutional monarchist in opinion, he found himself called to live in a democratic society and under a republic. Convinced as he was that the great movements of history have their real origin in the very nature of things, and that one can influence one's contemporaries and one's compatriots only by accepting the tendencies and conditions of the time, he was able to reconcile himself to the democracy and the republic, and to appreciate their advantages without ignoring their difficulties and their dangers.

Henceforth, therefore, Renan was in full possession of his powers and in full harmony with his time. Emancipated from the Church, he was the interpreter of free thought in its loftiest and most learned form, in a country which regarded clericalism as the most formidable enemy of its new institutions. Emancipated from Germany, and finding in the very misfortunes of his country a stimulus and a spur to his patriotism, he sought to make his writings the most perfect expression of the genius of France. Emancipated from all the fetters of extinct political systems, he

offered to a new France the counsels and the warnings of a clear-sighted and devoted friend. In his writings there was no ground on which he did not venture. In the midst of his great historical and exegetical work, his translations of Job, Ecclesiastes, and the Song of Songs, his superintendence of the difficult undertaking of the Corpus Inscriptionum Semiticarum, his contributions to the literary history of France—contributions which are triumphs of minute and accurate erudition—and while drawing up, year by year, for the Asiatic Society, a survey of all the new works on Oriental subjects, he was giving to the world his views and his visions of the universe and humanity, of life and of morals, now under the severer form of the Philosophic Dialogues, now in the light and softly ironical guise of the dramatic sketches—Caliban, L'Eau de Jouvence, Le Prêtre de Némi, L'Abbesse de Jouarre; and, in addition to all this, he was working hard at the reform of the higher education, and finding time to write those exquisite fragments of autobiography which are collected under the title Souvenirs d'Enfance et de Jeunesse.

In this expansion of all his faculties of thought and action, favored by the triple life of the study, the world, and the family, Renan was happy; and his joy in life and its activities gave to his philosophy a sunny optimism which might at first sight seem hardly reconcilable with the absence of all certitude, all metaphysical or religious conviction. People were surprised and a little shocked to find the author of the Moral and Critical Essays, the writer of those unforgettable pages on the dreamy melancholy of the Celtic races, the critic who poured reprehension on the frivolity of the Gaul and the *bburgeois* theology of Béranger, preaching at times a gospel of light-heartedness which Béranger himself would not have disavowed, and regarding life as an amusing entertainment of which we are at once the puppets and the spectators, and the wires of which are pulled by an amused but indifferent Demiurge. To many readers Renan became the mere apostle of dilettanteism, for whom religion was but an empty dream of the imagination or the heart, morality but an assemblage of conventions and conveniences, and life an illusive phantasmagoria which one must not be duped into taking seriously.

Nevertheless, those who best knew his work—and, above all, those who best knew his life—knew that this dilettanteism, this apparent epicureanism, did not really lie at the foundation of his mind and heart; that it was in part the result of the inward contradiction between his deeply religious nature and his conviction that there is no such thing as knowledge, except of phenomena, no such thing as certitude, except of finite things; and, for the rest, he was too sincere to affirm anything on subjects which could not be brought within the range of positive cognizance. His life

—the habitual attitude of his nature—was that of a Stoic, a Stoic without haughtiness and without rigidity, and with no idea of proposing himself as a model for others. His optimism was not the beatified self-satisfaction of a frivolous mind, but the chosen and cultivated optimism of the man of action, who feels that, in order to act, one must believe that life is worth living, and that some things are worth doing. Never was there a man more deeply benevolent, serviceable, and kind than Ernest Renan, however he accused himself of coldness in the service of his friends. Never was there a more scrupulous devotee of duty, public and private, faithful to the verge of heroism to every undertaking to which he had committed himself, accepting no office of which he could not fulfill all the obligations, and defying, toward the end of his life, the sharpest sufferings, in order to discharge to the last his professional duties. This apparently light-hearted man was subject for many years to attacks of a most painful illness; but he never allowed them to interfere with the integrity of his thought, or to hinder the accomplishment of the tasks which he had set himself. The last months of his life bore witness to the reality of his stoicism. He had often expressed the wish that he might die without pain and without any enfeebling of the mind. He had, indeed, the happiness of retaining his faculties to the last; but pain was not spared him. He dreaded it beforehand, as depressing and degrading; when it came, he did not allow himself to be depressed or degraded by it. From the month of January he knew that there was no hope; he told his friends so; and he asked nothing more but time and strength to finish his lectures and complete the works already in hand. He wished once more to visit his beloved Brittany; then, feeling himself grow worse, he insisted on returning to Paris, to die at his post as head of the Collége de France. His death took place there on the 2d of October.* During these eight months he suffered incessant pain, sometimes so severe that he could not speak; but he was still gentle and affectionate to those around him, trying to cheer them, and telling them that he was happy. The very day of his death he found strength to dictate a page or two on Arabic architecture to his wife. He congratulated himself on having attained his seventieth year—"the normal life of man, according to the Scriptures." One of his last utterances was: "Let us submit ourselves to these laws of Nature, of which we ourselves are one of the manifestations. The heavens and the earth remain."

To those who have known him, he leaves an ineffaceable memory. There was nothing in his personal appearance to suggest that irresistible charm. Short of stature, with an enormous head

* 1892.

set deep between wide shoulders, afflicted all too early with an excessive stoutness which made his gait heavy, and was the cause —or the symptom—of his mortal malady, he seemed to those who saw him only in passing an ugly man. But you had to speak with him but a moment, and all that was forgotten. You noticed at once the broad and powerful forehead, the eyes sparkling with life and wit, and yet with such a caressing sweetness, and, above all, the smile which opened to you all the goodness of his heart. His manner, which had retained something of the paternal affability of the priest, the benedictory gesture of his plump and dimpled hands, and the approving motion of the head, were indications of an urbanity which never deceived, and in which one felt the nobility of his nature and his race. But the indescribable thing was the charm of his speech. His portentous memory kept him supplied with new facts to contribute on every subject, while his splendid imagination and the originality and distinctness of his ideas enriched his often paradoxical conversation with flights of poetry, with illustrations and comparisons the most unexpected, and now and then with prophetic glimpses into the future. He was an incomparable story-teller. The Breton legends, passing through his lips, acquired an exquisite flavor. He had no liking for discussion, and has often been satirized for the facility with which he would give his assent to the most contradictory assertions. But this complaisance toward other people's ideas, which had its source in a politeness not always quite free from disdain, did not prevent him from firmly maintaining his opinion when any serious question was in debate. He detested controversy.

One merit he had which no one dreams of disputing. He was beyond comparison the greatest writer of his time; and he is one of the greatest French writers of all time. Brought up on the Bible, the Greek and Latin classics, and the standard authors of France, he had accustomed himself to a fashion of speech, at once simple and original, expressive without oddity, and supple without languor; a style which, out of the somewhat restricted vocabulary of the seventeenth and eighteenth centuries, could sufficiently furnish itself to render every subtlest shade of modern thought—a style ample, sparkling, and sweet beyond all parallel.

In the region of the learned studies Renan has not been a creator. Neither in philology, nor in archæology, nor in exegesis, has he made any of those great discoveries, or founded any of those systems, which renew the face of science. But no other man can lay claim to an erudition at once so universal and so precise as his. Language, literature, theology, philosophy, archæology, and even natural history—no branch of human knowledge was alien to him. His profound acquaintance with the past, together with the magic gift which enabled him to clothe it with flesh and

make it stand upon its feet, made him an incomparable historian. And it may be said that he has enlarged the domain of history by admitting into it the history of religions.

If Renan was not a creator in the domain of learning, neither was he an innovator in the domain of philosophy. His theological studies, while they developed in him the qualities of the critic and the *savant*, tended to disgust him with metaphysical systems. He was too much a historian to see in these systems anything but the dreams of human ignorance amid an assemblage of things it could not understand, the successive *mirages* thrown up before the mind by the changing spectacle of the world. But if he was not a philosopher, he was a great thinker. He flung broadcast on every subject he touched—on art or politics as on science or religion—the most original and the most pregnant ideas.

As to his skepticism and his so-called dilettanteism, they were but the consequence of his sincerity. Afraid, above all things, of deceiving or being deceived, he had no fear of proposing contradictory hypotheses on subjects where he believed certainty to be impossible. People have wondered that the same man who wished to have the words "Veritatem dilexi" placed upon his tomb should so often have asked with Pilate, "What is truth?" But these questions, not unmingled with irony, were themselves a homage to the truth. He perceived that for most men the love of the truth means intolerance, fanaticism, particular opinions received by tradition or born of the imagination, always destitute of proof and destructive of freedom of thought. To assert opinions which he could not prove seemed to him an insufferable impertinence, an infringement of intellectual liberty, a want of sincerity toward himself and others. And he bore himself this testimony: That he had never consciously uttered a lie. He regarded it as stoicism, not skepticism, to go on in the practice of duty without knowing whether it had any objective reality; to live for the ideal without believing in a personal God or in any future life.

And now, if we are to ask what is the special characteristic by which Renan must take rank among the great writers and great thinkers of the world, we shall find that his supremacy resides in his peculiar gift of seeing Nature and history in their infinite variety. He recreated the universe in his own brain; he thought it out again, so to speak; and that in a variety of versions. The spectacle that he thus inwardly conceived and contemplated it was given him to communicate to others by a sort of enchantment of persuasive speech. This power of creative contemplation was the main source of the continual gladness which illumined his life, and of the serenity with which he accepted the approach of death.

EDITOR'S TABLE.

THE INSOLENCE OF OFFICE.

SHAKESPEARE, who knew a good deal, in enumerating some of the ills of life, coupled with "the insolence of office," "the spurns that patient merit of the unworthy takes." For a present-day commentary on these familiar texts we refer our readers to the article by Dr. E. W. Claypole, which appears in this number, under the title of Prof. G. F. Wright and his Critics. Prof. Wright is a man who has for many years past been devoting so much of his time as he could spare from other duties to the study of a certain class of geological phenomena—those connected with the so-called Glacial period. Not being aware that there was any apostolical succession in science, but thinking rather that it was a field which any one might enter and cultivate to the best of his ability, Prof. Wright did not seek any official consecration for his labors, but simply went ahead, read all he could read, saw all he could see, worked over his materials as carefully as he knew how, and after some time produced a book which had the good fortune to be favorably received both in this country and in Europe. This book was guarded in statement, modest in tone, and scientific in method and spirit. The learned world found a good deal in it that was of value, and general readers must have deemed it interesting, for, though only four years old, it has already passed into a third edition. There was nothing in this, one would suppose, to provoke the wrath or jealousy of other scientific workers. Nevertheless, in a certain quarter, wrath was stored up for the author; the storm center was at the national capital, and its core, if we may use the expression, was in the Geological Survey. Of all arrogant things in the world official science is perhaps the most arrogant, and of all obstructive things official science is perhaps the most obstructive. The gentlemen of the Survey, or a number of them at least, were outraged to think that, while they were pottering in the leisurely fashion natural to Government officials over the questions in which they deigned to interest themselves, a man like Prof. Wright, who devoted only a portion of his time to geology, should have the audacity to come forward and express his views on one of those questions. They did not at first attack his book on The Ice Age in North America, but they apparently determined to watch the subsequent movements of this dangerous man, and, if occasion offered, to empty on him the vials of their official displeasure. The occasion was given by the publication of his book on Man and the Glacial Period; and then, all along the line, began a withering—or what was meant to be a withering—fire of criticisms on the professor and his work as a geologist. His one unpardonable sin would seem to have been that he had taken the word of scientific prophecy out of the mouths of the priestly caste at Washington. Had he only kept silence, they would, in their own good time, have told the world as much as it was good for it to know about the Glacial epoch and the antiquity of the human race. But, by his untimely publications, he had disturbed their sacred broodings over these momentous problems, and made it necessary for them to raise a warning cackle—like the sacred geese of Rome—to save the citadel of scientific truth from sack and pillage. Is it any wonder that the cackle was noisy and harsh and unamiable? Under circumstances so distressful how could it be otherwise? Some samples of it are given in Dr. Claypole's article, which

will be found most instructive reading by all who care to know in what terms official science is pleased to express itself when its ire is roused, and also what extensive means a widely ramifying body like our national Geological Survey possesses for attacking and discrediting the work of individual scientific laborers that happens to have been conducted on lines which the ruling spirits of that body do not approve.

The question arises, How much does the country really want of this kind of thing? In granting an appropriation for the Survey did it mean to endow a Holy Inquisition or a Sacred Congregation of the Index? We think not. The methods of such institutions make neither for the moral dignity nor for the advancement of science.

TEACHING NOT A FUNCTION OF GOVERNMENT.

The articles which Dr. J. M. Rice is contributing to The Forum on the public-school system of this country tend to bear out our contention in these columns, a couple of months ago, that but a small part of the special teaching ability existing in the community finds its way into the public schools. Speaking of the schools of this city, Dr. Rice says: "The typical New York city primary school, although less barbarous and absurd than the one just described, is nevertheless a hard, unsympathetic, mechanical drudgery school, a school into which the light of science has not yet entered. Its characteristic feature lies in the severity of its discipline—a discipline of enforced silence, immobility, and intellectual passivity." After describing how certain lessons are given, the writer goes on to say: "By the use of this method the child is actually prevented from exercising his reasoning faculties, and reading is converted into a pure and simple process of memorizing word-forms." Think of it: taxes being taken, and an elaborate system maintained, with the ultimate result of actually impairing the intellectual powers of the children! But that, we fear, is not the only damage. What must be the effect on the moral nature of "hard, unsympathetic, mechanical" methods? What must be the reaction from the remorseless discipline which Dr. Rice declares to be the "characteristic feature" of these schools? There can be little doubt that such a discipline hardens the nature, and that it must actually incline many to criminality there is too much reason to fear.

"It is not difficult," says Dr. Rice, "to account for the low standard of the New York schools; indeed, under existing conditions, it would be surprising if the instruction were of a higher order." He then proceeds to describe those conditions. In the first place, there is no incentive to teach well. Upon this point we feel like remarking that to say that a teacher has "no incentive to teach well" presents to our mind nearly the same incongruity as to say that a preacher has no incentive to preach well. We are far from maintaining that a teacher is not the better for incentives, but if there is any profession which might supply its own incentives, it seems to us to be that of teaching. It is certainly not too much to say that the true teaching spirit must be sadly lacking when teachers do not take sufficient interest in their work to do it at least to the best of their ability. The fact, of course, is that the position of teacher under our public-school system is sought after just as any other public office would be. The man who goes to Washington, to Albany, or to the City Hall, in search of an office, does not, in general, canvass very narrowly his fitness for the office; what he canvasses is the fitness of the office for him from a pecuniary point of view; and so precisely with the offices which our school boards have to bestow. To return, however, to the lack of incentive. This lack consists chiefly in the fact that no penalty or disadvantage at-

tends poor teaching. "In New York city," we read, "teachers are rarely discharged even for the grossest negligence and incompetency. In order that a principal may be discharged, sixteen of the twenty-one members of the Board of Education must vote against her; and, for many reasons, it is practically impossible to secure that number of adverse votes."

The other conditions to which Dr. Rice refers as unfavorable to the production of a high type of teaching are, briefly, lack of proper supervision, a generally chaotic system of administration, and the predominance of private or political influence in connection with the selection of teachers and principals. "In selecting principals," we are told, "expert qualifications are not taken into account. Indeed, as a rule, the newly appointed teachers are better, professionally, than the principals. . . . Nearly all appointments are made by 'pulls,' merit being a side issue." This is bad, but we are not at the end yet of our discouragements. "In regard to the public," Dr. Rice observes, "the mere fact that things are muddled as they are proves that the citizens take no active interest in the schools." Strictly speaking, is it to be expected that they should? People take an active interest in things that they can directly and more or less visibly control; but this is not the case with the public schools. The action of the individual citizen upon the schools is a most indirect action, the result of which can seldom if ever be distinctly traced. Again, people take an active interest in things that immediately affect their comfort or welfare, but either no interest or a much diminished one in things that affect them only indirectly and perhaps remotely. Thus, if a man has a letter detained to his injury in the post office, he will promptly complain, because he knows that his complaint will probably bring home the fault and the responsibility to some particular individual, and secure, if not compensation for his loss, at least an increase of attention to avoid similar errors. He acts because his interests are directly affected, and because his action may be expected to produce some immediate effect of a beneficial kind. How different all this is from the case of a citizen whose children are not being as well educated as they might be in a public school, but, on the contrary, are being made the victims of a "hard, unsympathetic, mechanical" routine! What is *he* going to do about it? How, indeed, can he establish the fact in the first place? Must he not wait until somebody like Dr. Rice comes along to tell him about it, and if somebody else—some official of the Board of Education, or some partisan of the board—confidently pronounces Dr. Rice a crank and a busybody, how is the citizen going to decide? Then, supposing he does decide that the education is bad, what is next to be done? Why, canvassing and electioneering, with the interminable vista they open up of deals and dickers, of flatulent talk and endless mystification! Dr. Rice sees all this as well as we do, for what does he say? "That the schools of small cities may be improved in a comparatively short time is a matter that has been repeatedly demonstrated; but *how to improve the schools of large cities is a problem that has never been solved.*"

We have left ourselves space to say but a few words of Dr. Rice's experiences in Boston. There he found better administration, owing principally to the fact that ward politics are kept at a greater distance. There incompetent teachers are removed as soon as their incompetence becomes manifest. And yet we read that "the Boston primary schools belong, in my opinion, to the purely mechanical drudgery schools. . . . The teaching is highly unscientific, and the teachers, though not really severe in the treatment of the pupils, are nevertheless cold and unsympathetic." In "one of the best" of the seven primary schools that Dr. Rice visited he found the

reading in the highest (third year) class "expressionless, thoughtless, and mechanical." On the other hand, the Boston grammar schools were found, on the whole, to be highly efficient—a circumstance, however, which can in no sense be regarded as an offset to the inferior condition—if Dr. Rice's criticisms are well founded—of the primary schools.

To our mind it is perfectly plain that the modern world has not yet discovered the true method of grappling with the educational problem, and that sooner or later it will have to revert to individual responsibility and individual effort for its solution. We do not deny that relatively satisfactory results may here and there be reached under the present system; but any system which to a large extent prevents the special talent that is available for a given task from being applied to that task is fatally defective; and that, as we conceive, is the case with state education. The born educators, those possessing by nature the aptitudes and the sympathies required for educational work, those who could—granted, of course, proper training—redeem such work from drudgery and make it a true process of thought and soul development, will not in general take service in state-directed schools, and, at the same time, they will be debarred, by the competition of the state, from what would be their most congenial employment. Such is the dilemma; and the conclusion to which it points is that some day we must retrace our steps, and make education the business of the family to be obtained as other good things are obtained—as all best things are obtained—by effort and sacrifice.

THE AMERICAN PSYCHOLOGICAL ASSOCIATION.

The first regular meeting of the American Psychological Association, a short account of which is given on another page, was a very significant gathering. It is an evidence of the fact that a common bond of scientific interest in the study of mental phenomena is now sufficiently strong and sufficiently extended to warrant a comprehensive organization. This most disputed field of mental science has, in recent years, been rendered subject to an increasing extent to scientific methods, and a psychological laboratory is no longer regarded as a curiosity, but as an essential department in every higher institution of learning. It is notable that, since the foundation, some ten years ago, of the first laboratory, by Prof. G. Stanley Hall, at Johns Hopkins University, others have been instituted one after the other, so that at the present time there are more such laboratories in this country than in Europe. It was only natural that, when Prof. Hall became the President of Clark University, the formation of a strong psychological department should have been one of the prominent subjects to engage attention. Soon afterward, laboratories were founded by Prof. Cattell at the University of Pennsylvania, later at Columbia College; by Prof. Jastrow, at the University of Wisconsin, and at other institutions; and within the past year Harvard has set a noble example by equipping a magnificent laboratory and securing for its director that eminent psychologist, Prof. Muensterberg, of Freiburg. Yale has likewise founded a laboratory, and placed Prof. Scripture at its head; and another laboratory is soon to be opened in another prominent Eastern college. Nor does the list end here; it includes a dozen more colleges of various degrees of prominence. All this gives evidence of wide interest in a strictly scientific method of research, and promises to make the study of psychology something far different from what it has hitherto been. The organization of this small but influential body of men engaged in this work is therefore significant of a tendency of modern thought which seems destined to become particularly impor-

tant in the development of American education. The society will find a welcome among the general body of scientific men, and its proceedings, while perhaps not very widely read, will undoubtedly constitute a worthy contribution to American scholarship.

LITERARY NOTICES.

THE LIFE OF JOSHUA R. GIDDINGS. By GEORGE W. JULIAN. Chicago: A. C. McClurg & Co. Pp. 473. Price, $2.50.

HARDLY anything can strike the student of history more impressively than the realizing sense which he gains on reading the story of one of the old heroes of the antislavery controversy, such as Mr. Giddings was, of the utter unlikeness of the conditions of the present time in this country and the questions with which it is now occupied, to those which prevailed before the war, within the active memory of men still in the vigor of life. The review furnishes an astounding revelation of the extent to which we have made history within a generation, and of the completeness of the overthrow that has overtaken a force that was once autocratic in its dominance. Mr. Giddings entered the national House of Representatives in December, 1838, and served there continuously till March 4, 1859. When his service began, the "twenty-first (or 'gag') rule," which forbade the discussion of slavery in the House, and under which the hearing of petitions against it was refused, had been in force two years, and John Quincy Adams was beginning the war against it which he pursued to ultimate victory. Mr. Giddings's attention had only been directed to the national importance of the slavery question in the previous year, and he and Mr. Wade, his law partner, afterward famous in the Senate, had joined in the formation of an antislavery society of four members. In the House of Representatives, John Quincy Adams and William Slade, of Vermont, were the two members whose views on slavery were in harmony with his. After their retirement, Mr. Giddings for a time stood alone. He early perceived the shape which the question was destined to assume, and made it his mission, as Mr. Julian remarks, "to watch the encroachments of slavery upon the rights of the people of the free States, and to hold the slave masters strictly to their own avowed principle, that the existence and continuance of slavery depended solely on the authority of the States in which it existed. Wherever he saw this principle violated, he felt it to be his duty to lift up his voice in its defense." Recognizing the constitutional guarantees, while he construed them with the utmost strictness, he never suggested interference within the sphere of State jurisdiction. He began his "defense," during his first session, with an attack on the slave trade in the District of Columbia. The direct consideration of the subject being forbidden, a bill making an appropriation for building a bridge across the Potomac, and sundry memorials against antislavery petitions, furnished the occasion for his argument; and no opportunity was neglected afterward to press the forbidden sentiments upon the attention of the legislators. He was "cut" in society; attempts were made to engage him in quarrels; he was threatened with bodily violence; and he bore all bravely and with dignity. A resolution of censure was passed against him without his being given an opportunity to define his position. He resigned at once, went back to his constituents, and was triumphantly re-elected, to return with a new commission to deliver his message more earnestly and bravely than before. At last he missed a renomination—not too soon, Mr. Julian thinks, as he surveys the record in the light of history—and was succeeded by another, with principles like his own. The dominating fact in his life was moral earnestness, which was the master key to his character, inspired and invigorated all his faculties, and assured him the confidence of his constituents. In Mr. Julian, his son-in-law, and a Congressman who also participated for many years in the antislavery controversy, he has found a most competent and appreciative biographer. Experience since the war has shown that our country is threatened by other evils, hardly less aggressive and arrogant than the one which Mr. Giddings fought; but resistance against them, under all discouragements, can not be more hopeless than his contention seemed during most of the time he was making it. The final triumph of the cause he advocated, over apparently

insurmountable obstacles, makes appear more practicable the contention of those who are warring upon the abuses and tyrannies of the present.

PSYCHOLOGY. By WILLIAM JAMES. New York: Henry Holt & Co. (American Science Series, briefer course). Pp. 478.

THE author's chief aim in preparing this abridgment of his larger work on the Principles of Psychology has been to make it more directly available for class-room use. For that purpose he has omitted several chapters and rewritten others; has left out the polemical and historical matter, the metaphysical allusions and purely speculative passages, the book references, and most of the quotations of the larger work; and has added brief chapters on the various senses. By these changes he believes that his presentation of the subject as a "natural science" has gained in clearness by its extrication from so much critical matter and its more simple and dogmatic statement. His definition of psychology is "the description and explanation of states of consciousness as such." As a natural science it, in common with the other natural sciences and in spite of the fact that further reflection leads to idealism, assumes that a world of matter exists altogether independently of the perceiving mind. Besides this it assumes additional data peculiarly its own, and leaves it to more developed parts of philosophy to test their ulterior significance and truth. These data are thoughts and feelings, or transitory states of consciousness, and knowledge, by these states of consciousness, of other things. Mental facts can not be properly studied apart from the physical environment of which they take cognizance. Mind and world have been evolved together, and in consequence are something of a mutual fit. The special interactions between the outer order and the order of consciousness, by which this harmony has been brought about, have been the subject of evolutionary speculations, which, though they can not so far be said to be conclusive, have refreshed and enriched the subject, and brought all sorts of new questions to the light. The conception that the immediate condition of a state of consciousness is an activity of some sort in the cerebral hemispheres, which underlies the physiological psychology of recent years, is the working hypothesis of this book. After the chapters on the senses, structure and function of the brain, and general conditions of neural activity, the subjects of habit, the stream of consciousness, the self, attention, conception, association, the sense of time, memory, imagination, perception, the perception of space, reasoning, emotion, instinct, will, and psychology and philosophy are discussed; and the conclusion is reached that psychology does not yet stand on solid ground, but is waiting for its Galileo and Lavoisier.

ABRAHAM LINCOLN. THE TRUE STORY OF A GREAT LIFE. By WILLIAM H. HERNDON and JESSE W. WEIK, with an Introduction by HORACE WHITE. New York: D. Appleton & Co. Two vols. Pp. 331 and 348. Price, $3.

MR. HERNDON'S theory of a biography is that it should tell the whole truth; not give prominence to certain traits or events which flatter a little or brighten the glory of the subject, and withhold others which may have been equally potent in determining the character and fortunes because they are of a darker nature, and may infuse a little unpleasantness into the picture; but to give both sides, and to each incident, whether pleasant or unpleasant, its due prominence, according to the magnitude of its effect on the life as a whole. To him the biographies in the Bible are models, in which none of the faults and offenses of those who are otherwise held up as noble characters are extenuated, but each is related in all its enormity. Mr. Herndon was the life-long intimate friend of Mr. Lincoln and his law partner for many years. He regarded him with a genuine, enthusiastic, personal admiration. He contemplated the book for twenty years, but not being a literary man made little progress in composing it till he put it into the hands of Mr. Weik, whose habits and training were favorable to its successful execution. His purpose is to deal with Mr. Lincoln individually and domestically—as a lawyer, as citizen, and as statesman. Especial attention is given to the history of his youth and early manhood; and in this to give some things that other biographies do not have. "The endeavor is to keep Lincoln in sight all the time; to cling close to his side all the way through—leaving to others the more

comprehensive task of writing a history of his times. I have no theory of his life to establish or destroy. Mr. Lincoln was my warm, devoted friend. I always loved him, and I revere his name to this day. My purpose to tell the truth need occasion no apprehension, for I know that 'God's naked truth,' as Carlyle puts it, can never injure the fame of Abraham Lincoln. It will stand that or any other test, and at last untarnished will reach the loftiest niche in American history." Of Mr. Herndon's fitness for this task, Mr. Horace White says, in the introduction which he contributes: "What Mr. Lincoln was after he became President, can be best understood by knowing what he was before. The world owes more to William H. Herndon for this particular knowledge than to all other persons put together. It is no exaggeration to say that his death, which took place at his farm near Springfield, Ill., March 18, 1891, removed from earth the person who of all others had most thoroughly searched the sources of Mr. Lincoln's biography, and had most intelligently and also lovingly studied his character. He was generous in imparting his information to others. Almost every life of Lincoln published since the tragedy at Ford's Theatre has been enriched by his labors. He was nine years the junior of Mr. Lincoln. Their partnership began in 1843, and it continued until it was dissolved by the death of the senior member. Between them there was never an unkind word or thought." Mr. Weik, the co-author, was for several years indefatigable in exploring by personal investigation the course of Lincoln's life, never satisfied with taking anything at second hand, but following everything up to its source. Mr. Horace White has enriched the book by contributing personal recollections of his association with Mr. Lincoln during the debates with Douglas—by which Mr. Lincoln's fame was established.

HOW SHALL MY CHILD BE TAUGHT? Pp. 276. THE SPIRIT OF THE NEW EDUCATION. Pp. 282. By LOUISA P. HOPKINS. Boston: Lee & Shepard.

THE material of these volumes consists of various papers and addresses written by a supervisor of the Boston public schools. They are not merely theoretical, but embody the results of a fruitful experience in primary teaching and in the training of teachers. Altogether they present a plea for the natural method of education, which, although the oldest form of instruction, is now called "new," as opposed to the prevailing mode of memorizing from text-books. No better comment can be made on this reform in teaching than that of Colonel Higginson: "The difference between a natural and an arbitrary method of acquiring knowledge is simply the difference between rowing with the current or against it." The desire of the child sent to school is generally to observe, to question, and to construct. He is for the most part taught to look only at his books, to be quiet, and to make nothing. It is in the primary and preparatory schools that learning by rote still flourishes. At the beginning and end of our educational system we have given up artificial culture; we have object lessons in the kindergarten, the laboratory, and lecture in the university. Meanwhile, manual and industrial training act as wedges for the introduction of freedom in the intermediate schools.

The new method is not only the better way to educate, it also helps to mold character. The object of education is even more important than the form. The way in which the school thrusts aside responsibility for moral development is exemplified in the boy who "could lie, steal, and swear unchecked, but, if he chewed gum in school, got an awful thrashing." Here the method of teaching is morally operative. If the child's activities are not repressed, but directed toward some absorbing work, there will be little occasion for misconduct. In any case, petty discipline defeats itself and corporal punishment is the resource of the teacher who has failed.

How shall my Child be taught contains discourses upon primary teaching, an account of a year's experiment in training, parables on Nature and life, and oral lessons in arithmetic and science. In illustrating mental action there is an astonishing note to teachers. The author directs that the distinction between mind and brain shall be fully shown by citing cases of unconscious cerebration: "They will then know that the mind is quite distinct from the brain, and the soul can live without this body"!

In The New Education there are practi-

cal papers upon physical and manual training, the moral problem, Froebel's theories, the school curriculum, elementary science, character and school education, citizenship, and industrial reform. More speculative are those upon the education of the soul, our divine relationships, and woman as an educator. From the latter we learn that "woman is provided with sensitive, man with muscular tissue," and also that "woman looks into the mystical unseen." Possibly this does not include clairvoyance or spirit-rapping, but is only a poetical phrase for some indefinable power contingent upon the finer feminine structure.

THE NATIONALIZATION OF HEALTH. By HAVELOCK ELLIS. London: T. Fisher Unwin. New York: G. P. Putnam's Sons. Pp. 244. Price, $1.25.

THE author pleads in this book that the primary conditions of health should be recognized as of first importance to the community; and he regards it as a blot on modern civilization, setting it in an unfavorable light as compared with such civilizations as the Roman and Moorish, that they are so neglected, as the chief element of rottenness in it. "We postpone," he says, "laying the foundations of our social structure in order to elaborate its pinnacles. We are acquainted with all possible openings for commerce through the world; we have explored the psychological ramifications of sentiment; and we do not know the course of the main sewers in our city, and we pollute the sources of the water we drink. We have not yet learned that a great civilization is all built upon the bodies of men and women enfeebled and distorted by overwork, filth, and disease." The present is regarded as a peculiarly favorable time for taking in hand seriously the organization and socialization of the elementary conditions of health, on account of the public and official attention that has been given to the matter in recent years. We also possess to-day, the author affirms, a closer grip of the conditions of health than has ever been possible before, and are better able to unravel their complexity and to show clearly what a man should do who would live a healthy life. "The key-word of our modern methods is not cure but prevention, and while this task is more complex it is also far easier. It is to a gigantic system of healthy living by a perpetual avoidance of the very beginnings of evil that our medical science is now leading us." The present condition of the new movement for the prevention of disease, here referred to, is sketched; then the present position of the more ancient system of the treatment of disease—by the medium of friendly societies, in private practice, in hospitals, and infirmaries, with respect to special classes of disease; the registration of disease; and industries as related to health are discussed; the evils of the *laissez-faire* system are exposed, as illustrated now in Russia; and the conclusion is reached that the maintenance of the conditions of health is not a merely national question, but calls for international co-operation and action. The recognition of this fact is already seen in the holding of International Congresses of Hygiene, which have done much to consolidate, unify, and stimulate the various movements connected with public health.

THE GREAT ENIGMA. By WILLIAM SAMUEL LILLY. New York: D. Appleton & Co. Pp. 334. Price, $4.

MR. LILLY may always be trusted to present the broadest comprehension and ablest exposition of the Roman Catholic view of controverted questions. The present work, which is composed chiefly of articles already published in leading English reviews, where they have been read widely and appreciated, is an inquiry, supposed by the author to be from the point of view of a class of readers "practically outside the Christian pale," into the tenableness of the religion "which for more than a thousand years has supplied the foremost nations of the world with an answer to the great enigma of human existence." It presents, in aid of the solution of that question, certain considerations which have been helpful to Mr. Lilly, with special reference to the religious difficulties peculiar to these times. "Possibly they may be of use to some who find themselves unable to employ the old theological symbols." In the first article, or chapter, which is entitled The Twilight of the Gods, the present conditions of religious doubt are described; it is assumed, for the purpose of the argument, that the solution of the enigma presented by

theistic belief, and especially by Christianity, is discredited; and the intention is announced to consider the other solutions offered in their theoretical and practical aspects, and to inquire whether Theism in general, and the Christian religion in particular, are so utterly untenable as is very generally contended. The two answers, besides Theism, to the great enigma are atheism and agnosticism. Atheism is described as teaching that the answer to the great enigma is not moral but material; that faith in the Divine must be put aside as a senseless and servile superstition; that the rule of right and wrong is to be found in self-interest; that ethics is only a regulation of police; that physical fatality must be acquiesced in; and as holding out the practice of a "brutal egoism." Of that kind of agnosticism which is merely critical and negative, and is content with professing nescience of God, M. Renan's career and writings are held up as a type. His criticism, after examination, is pronounced inadequate to support the vast edifice of doubt which he reared upon it. The other kind of agnosticism, scientific or affirmative, which asserts the existence of God but denies that he can be known, is considered best represented by the philosophy of Herbert Spencer—"Mr. Spencer's portentous generalities." This is examined in detail, criticised unsparingly, and is declared to leave the mystery of "the immeasurable world" precisely where it found it. The inquiry is next made whether Theism is, in fact, so hopelessly discredited as is frequently and confidently alleged. Mysticism, or the doctrine of the inner light, is then examined in the four chief systems—Hindu, Greek, Moslem, and Christian—in which it has been clothed, and the conclusion is reached that while, in the more vulgar manifestations of religion, it may assume most unlovely forms, it is still there, "potent in its divine virtue to slake the thirst of human nature for a great good transcending sense." Finally, the claims of the Christian synthesis are considered, with the conclusion that, "while no one pretends that Christianity offers us a complete explanation of the scheme of things, there is no more reason in the nineteenth century than there was in the first why its message should not be received by cultivated and intelligent men, who feel their need of it, and who will carefully and candidly examine its claims for themselves." We think Mr. Lilly has failed to appreciate the importance of the contributions which Mr. Spencer and the exponents of scientific inquiry into the questions he discusses have made to a clearer understanding of the subject. By enlarging the sources of knowledge and broadening the lines of thought, they have made it possible to regard the questions from different sides, and thereby to take more comprehensive views of them; by more plainly defining the essential points, they have enabled us to discern them unencumbered by minor features and the rubbish which tradition and superstition have heaped around them; and by presenting them distinct, in strong light, they have enabled us to apprehend them undisturbed by the perplexing excrescences which made conception of them difficult and embarrassed faith; and have thus augmented rather than diminished respect for the fundamental principles of Christianity and their hold upon candid minds.

METAL COLORING AND BRONZING. By ARTHUR H. HIORNS. New York: Macmillan & Co. Pp. 336. Price, $1.

IT is surprising to find that the Japanese still surpass us in artistic metal coloring, notwithstanding our chemical knowledge of alloys. This is acknowledged to be the case by the author of this volume, who asserts that even "the bloom of fruit is faithfully reproduced" by them, and inharmonious coloring is unknown in their work.

Some advance, however, may be expected among us now, as we begin to realize that metal is beautiful when finished as metal, and not when perverted to an imitation of wood or glass.

This book is the result of experiments in bronzing which have been most carefully conducted. Many old recipes have been tested, as well as methods now commonly used in France. The first part of the work is devoted to the chemical and general relations of the subject; the preliminary treatment of metals follows; and the three remaining sections contain chemical metal coloring, electrochemical processes, and mechanical metal coloring. Some remedies to be used in case of accident and suggestions for preventing ill

effects are given, and an index is appended. The text is concise and clear, and the book can not fail to be of use to those interested in the art of bronzing, or to students of metallurgy.

A HISTORY OF MODERN PHILOSOPHY, FROM THE RENASCENCE TO THE PRESENT. By H. C. BURT. Chicago: A. C. McClurg & Co. Two volumes. Pp. 368 and 321. Price, $4.

THIS work aims to present in considerable fullness, yet with suitable brevity, the principal content of the leading systems and partial systems of philosophy in modern times, together with a reasonable amount of information regarding philosophical authors and works. It aims to show, in a general way at least, the historical connections of systems, or to exhibit the historical continuity of modern philosophical thought, and further, to furnish materials and stimulus to the student for the study of the higher genesis and final values of ideas and systems. Modern philosophy, according to the author's definition, as distinguished from mediæval philosophy, is occupied with the immanent and concrete rather than the transcendent and abstract; with the natural and the human rather than with the unnatural and the superhuman. As distinguished from ancient philosophy, it is occupied with the subject rather than with the object; with thought, rather than with being. It may be divided into three great periods, of which the first was one predominantly of reception and appropriation—though with considerable self-assertion as against mediævalism; the second, a period of original effort, very largely destructive or negative—toward previous philosophy as well as toward the object of thought generally; and the third as a period of equal originality and more constructive or synthetic effort. Psychologically speaking, those periods are periods of sense (receptive), understanding (analytic), and reason (synthetic); logically they are regarded as periods of thesis, antithesis, and synthesis. Their dates are from the middle of the fifteenth to the beginning of the seventeenth century, thence to the third quarter of the eighteenth century, and thence down to the present. An apparently disproportionate amount of space is given to certain recent systems, because they have not as yet become commonly known through other histories of philosophy. Closing with a brief glance at American philosophy, the author finds that the study of the science has been more seriously undertaken than ever before in our higher institutions—for its own sake and independently of theological influences; and that it seems safe to predict a vigorous future for it here.

THE BEAUTIES OF NATURE. By SIR JOHN LUBBOCK. New York: Macmillan & Co. Pp. 429. Price, $1.50.

SUCH lovers of Nature as Thoreau, Ruskin, and the poets give us exquisite pictures of her varied moods and phases; but men of science vie with them in their enthusiasm and even in charm of expression. Throughout this volume are found many fine descriptions of natural scenery culled from various sources, and most vivid and glowing of all are those of the naturalists. For the introduction, the author has prepared a calendar of the special charms of each month, and encourages us to closer observation by premising that the lover of Nature is always young and can never be dull! None can gainsay his claim that science has given us a greater possibility of enjoyment in revealing two new worlds of beauty—the infinitely great and the infinitely little.

Animal life offers many problems for our study—the extremes of temperature at which animals can exist, their metamorphoses, modifications of growth, mimetic coloring, and modes of communication. Not only do many animals possess in a more acute degree the senses known to us, but it is possible that they also have others of which we can form no conception. It has been proved that the ultra-violet rays which are invisible to us are perceived by some of the lower species, while others have organs richly endowed with nerves indicative of uses wholly unlike those of man. Curious questions arise in considering the development of gnats and the reproduction of zoöphytes and infusoria. We can no longer define individuality with them, and some species are theoretically immortal.

Among plants it is found that the reasons for their variation are more wonderful than the old myths invented to explain them. The woods and fields are full of mysteries. Trees, like human beings, may have chosen associates; the larch and arolla grow to-

gether in Siberia and in the Swiss valleys. Some species have their familiar parasites, others find food purveyors in certain fungi. The ruthless destruction of forests has occasionally involved that of nations, while the planting of pines has brought prosperity to barren lands. The subsidence and shriveling of the earth's crust result in mountain ridges; the lofty cones of volcanoes, however, are formed from accumulations of lava, and the causes of eruption are local. Rivers are older than mountains; to trace their origin involves a study of geological changes and the folding of the strata. When the slope is acute, they widen their valleys through the rocks; with a slight fall they may run upon an elevated bed of their own sediment. While the land undergoes constant change, the sea remains the same for us, and contains all manner of strange creatures—enormous cuttlefish, and medusæ which color leagues of ocean. The fauna of the depths differ entirely from those of the surface, and species which are found in both situations undergo modifications in the great abyss. Some possess luminous organs, in others the eyes are absent.

Science has given to us a fuller idea of the immensity and beauty of the starry heavens. Not only have our own planetary relations been unfolded to us, but innumerable systems have been made visible. The distant stars shine upon us through the telescope with multicolored light, and by their spectra we detect their movements and chemical constitution.

So, through this pleasant and instructive discourse on "the wonders of the world we live in," does Sir John Lubbock fully persuade us that science is a fairy godmother with untold treasures at her command.

Mr. *David T. Day's* Report on the *Mineral Resources of the United States* for 1889 and 1891, its contributors having been nearly all engaged in preparing the volume on the mineral industries for the eleventh census, contains substantially the statistics of the Census Office. A few minor exceptions consist of the cases in which the mineral report for the Census Office did not consider certain industries which are usually included in the reports of this series. The statistical tables of former years have been carried forward. The scope of the present volume has been lessened slightly in the effort to include more complete and accurate statistics from all producers in the subjects of coal, iron ores, and other important products. The total product indicated for 1890 was $654,604,698, an increase far beyond the total of any previous year.

Chemists and sanitarians will find in *The Coal-tar Colors, with Especial Reference to their Injurious Qualities*, by *Theodore Weyl* (Blakiston, $1.50), definite information as to how far these substances are poisonous. The book tells what colors have been found to injure the health of workmen employed in making them, what regulations concerning the use of poisonous colors have been made in Europe, what results have been obtained from experiments with various colors on animals, and other related facts. The essay was translated by Dr. Henry Leffmann.

Dr. *Franklin H. Martin* has prepared for medical students and practitioners a treatise on *Electricity in Diseases of Women and Obstetrics* (Keener). It embraces a statement of the general principles of electricity, fully illustrated descriptions of electrical apparatus designed for the physician's use, and accounts of the author's mode of using electricity in his specialty, with notes of cases. The volume contains seventy-nine illustrations and has an alphabetical index.

The treatise on *Rectal and Anal Surgery*, by *Edmund* and *Edward W. Andrews* (Keener), which has now reached its third edition, has the two objects of instructing physicians in its special subject, and of exposing the methods of a class of itinerant pile-curers that has flourished in the West. In the new edition nearly every part of the work has been rewritten and enlarged, a compact formulary has been added, and other additions have been made. The volume contains fifty-three illustrations.

In a well-written little volume entitled *Fermentation, Infection, and Immunity*, Dr. *J. W. McLaughlin*, of Austin, Texas, reviews the chief known facts concerning these subjects, and advances a new theory to account for them. His book is based upon partial statements of his theory in medical journals, which have received encouraging attention, and will doubtless prove of interest to biologists.

There is in Chicago an organization known as the Sunset Club, which holds meetings fortnightly for the discussion of social topics. Some of the addresses prepared for these discussions are printed in a volume with the title *Echoes of the Sunset Club*. The subjects treated are such as freedom of the press, subsidies and the tariff, the Sunday question, pensions, money and its functions, nationalism, anarchy, etc. Something of the customs and success of the club is told in a few preliminary pages. Those wishing to know if the book is on sale should address the secretary, at 154 Lake Street.

Under the title *Where is my Dog?* the Rev. *Charles J. Adams* presents a plea for belief in the immortality of the lower animals. His argument is briefly that because animals possess so much intelligence and morality as they frequently exhibit, they "ought" to be rewarded by immortality. Their masters, too, "ought" to be allowed to meet their lowly friends in another world. (Fowler & Wells Co., $1.)

PUBLICATIONS RECEIVED.

Anderson, Winslow. Mineral Springs and Health Resorts of California. San Francisco: The Bancroft Co. Pp. 384.

Barber, E. A., Westchester, Pa. List of Papers, Pamphlets, and Books. Pp. 8.

Boies, Henry M. Prisoners and Paupers. New York: G. P. Putnam's Sons. Pp. 318. $1.50.

Bonney, G. E. Electrical Experiments. New York: Macmillan & Co. Pp. 252. 75 cents.

Bottome, S. R. How to manage the Dynamo. New York: Macmillan & Co. Pp. 63. 60 cents.

Booth, Charles. Life and Labor of the London People. Volumes I and III. New York: Macmillan & Co. Pp. 300 each. $1.50 per vol.

Bowker, William H. Relation of Fishes to Agriculture. Boston: Wright and Potter Printing Co. Pp. 29.

Bulletin from the Laboratories of Natural History, State University of Iowa. Volume II. No. 3. Iowa City. Pp. 98. 35 cents.

Campbell, H. J. Text-book of Elementary Biology. New York: Macmillan & Co. Pp. 234. $1.60.

Chicago Daily News Almanac for 1893. Pp. 424. 25 cents.

Childs, G. W. Public Ledger Almanac for 1893. Pp. 77.

Clarke, Isaac Edwards. Industrial and Manual Training in Public Schools. Washington: Bureau of Education. Pp. 1338.

Commonwealth, The. A Weekly Magazine of Sociology. New York. Commonwealth Co. $1 a year.

De Beye, Baron J. Industrial Arts of the Anglo-Saxons. New York: Macmillan & Co. Pp. 135. With Plates. $7.

Densmore, Emmett. How Nature cures. New York: Stillman & Co. Pp. 413.

Densmore, Helen. The Maybrick Case. New York. Stillman & Co. Pp. 148. 25 cents.

Dodell, Arnold. Moses or Darwin? New York: Commonwealth Co. Pp. 326.

Dreyspring, A. The Cumulative Method French Reader. New York: American Book Company. Pp. 171. 75 cents.

Duffy, Terence. From Darkness to Light. San Francisco: The Author. Pp. 280.

Employer and Employed. Boston: Quarterly. Pp. 16. 40 cents a year.

Engle Sanitary and Cremation Company. New York. Pp. 32.

Errors in School Books. Boston: Albert A. Pope. Pp. 24.

Evans, Elizabeth E. A History of Religions. New York: Commonwealth Co. Pp. 128.

Evermann, Benton W. Description of a New Sucker. Washington: Government Printing Office. Pp. 6.

Fewkes, J. Walter. Journal of American Ethnology and Archæology. Volume III. Boston: Houghton, Mifflin & Co. Pp. 144.

Foster, Michael, M. D., and others, Editors. The Journal of Physiology. Volume XIV, No. 1. Cambridge, Eng. Pp. 130.

Gould, George M. The Antiseptic Dropper. Pp. 2.—A Case of Homatropine Susceptibility.—P. 1—Amblyopiatrics. Pp. 15. Reprints.

Gray, Andrew. Absolute Measurement in Electricity and Magnetism. New York: Macmillan & Co. Two Volumes. Pp. 868. $6.25.

Griswold, W. M. The Reader. Weekly. Cambridge, Mass. Pp. 12. 50 cents a year.

Hasty, E. E. What is Christianity? Richards, Lucas County, Ohio. Pp. 16. 2 cents.

Herrick, C. L. Mammals of Minnesota. Minneapolis. Pp. 299.

Hodges, C. F. Microscopical Study of Changes in Nerve Cells. Boston: Ginn & Co. Pp. 168. Reprint.

Holt, Thomas M. Biennial Message to the General Assembly of North Carolina. Raleigh: Pp. 68.

Jessopp, Augustus. Studies of a Recluse. New York: G. P. Putnam's Sons. Pp. 281. $2.50.

Jones, G. W. Logarithmic Tables. Ithaca, N. Y. Pp. 16.

Journal of the American Chemical Society. Volume XIX, No. 8. New York. Pp. 70.

Journal of the United States Artillery. Fort Monroe, Va. Volume II, No. 1. Pp. 176.

Keeler, Charles A. Evolution of the Colors of Birds. San Francisco: California Academy of Sciences. Pp. 361. With 19 Colored Plates. $5.

Keen, W. W. Umbilical Hernia, etc. Pp. 13. Reprint.

Kuh, Edwin J. Is Medicine a Science? Pp. 8. Reprint.

Kunz, G. F. Meteoritenstudien (Studies of Meteorites). Pp. 11. With Plates.—Brookite, Octahedite, Quartz, and Ruby. Pp. 2.—Farmington (Kansas) Aërolite. Pp. 3.—Fine New American Aërolites. Pp. 12.—On Two Meteoric Irons. Pp. 4.—Bohemian Garnets. Pp. 8.—Precious Stones. Pp. 9. Reprints.

Macfarlane, J. Muirhead. Minute Structure of Plant Hybrids. London: Williams & Norgate. Pp. 80. With 8 Plates.

Maryland Hospital for the Insane, Report for 1892. Baltimore. Pp. 88.

Miles, Manly. Heredity of Acquired Characters. Pp. 10. Reprint.

Monroe, Will S. Comenius. Pp. 7. Reprint.

Motherhood. Monthly. February, 1893. Pp. 68. $1 a year.

Nason, Frank L. Iron Ores of Missouri. Jefferson City, Mo. (State Geological Survey). Pp. 366. With Map.

North Carolina. State Auditor's Annual Report. Raleigh. Pp. 113.

Pope, Albert A. Catalogue of Books, etc., on the Construction and Maintenance of Roads. Boston. Pp. 12.—Wagon Roads as Feeders to Railways.

Proceedings of the American Philosophical Society. Philadelphia, December, 1892. Pp. 72.

Ryder, John A. The Synthetic Museum of Comparative Anatomy. Philadelphia. Pp. 15. Reprint.

Salazar, Prof. A. E., and Newman, Prof. O. Sur le Conservation des Dissolutions de l' Acide Sulphydrique (On the Preservation of Solutions of Sulphydric Acid). Translation from the Spanish. Paris. Pp. 16.

Schweitzer, Paul, and Woodward, A. E. Mineral Waters of Missouri (State Geological Survey). Pp. 256. With Map.

Shelldrake, Sparham. Christianity, Freemasonry, and Eastern Philosophy. Lakefield, Ontario. Pp. 13.

Shufeldt, R. W. Swifts and Humming Birds. Pp. 20.—The American Bittern. Pp. 2. Reprints.

Sweet, Henry. Manual of Current Shorthand. New York: Macmillan & Co. Pp. 137. $1.25.

Talmage, J. E. Domestic Science. Salt Lake City: G. I. Cannon & Sons.

Thompson, Herbert M. The Theory of Wages. New York: Macmillan & Co. $1.

Transactions of the Wagner Institute, Philadelphia. Volume III, Part II. Pp. 272.

University of Pennsylvania. School of American History and Institutions, Circular No. 1. Pp. 15.

Upton, Winslow, and Roach, A. L. Total Solar Eclipse of January 1, 1889. Cambridge, Mass.: John Wilson & Son. Pp. 34.—Solar Eclipse of August 19, 1887. Pp. 25. Reprints.

Ushur, J. E. Alcoholism and its Treatment. New York: G. P. Putnam's Sons. $1.25.

Vogel, E. Practical Pocket-book of Photography. New York: Macmillan & Co. Pp. 202. $1.

Ward, Lester F. The Psychologic Basis of Social Economics. Philadelphia: American Academy of Social and Political Science. Pp. 18.

Weil, Theodore. The Coal-tar Colors. Philadelphia: P. Blakiston & Son. $1.50.

Willcox, Joseph. Evolution of the Earth and of the Heavenly Bodies. Pp. 9.

Williams, C. M. Evolutional Ethics. New York: Macmillan & Co. Pp. 561. $2.60.

Winchell, H. V. The Mesalic Iron Range in Minnesota. Pp. 72.

POPULAR MISCELLANY.

Meeting of the American Psychological Association.—The first regular meeting of the American Psychological Association was held in Philadelphia, at the University of Pennsylvania, on December 27th and 28th. President G. Stanley Hall, of Clark University, presided at the meetings, and the papers presented gave good evidence of the variety and value of the work in experimental psychology which the laboratories of the various colleges are producing. Among the general papers presented, that of President Hall, giving a synopsis of the history and prospects of experimental psychology in America, was perhaps of widest interest. The important steps in the development of this movement within recent years were carefully traced, and various measures of credit judiciously assigned. The effect of the entire presentation was an extremely satisfactory one, showing that in America perhaps more prominently than elsewhere the laboratory method of instruction in psychology was becoming widely adopted, and that the general outlook for the steady development of psychological study was particularly hopeful.—Another very interesting presentation was that of Prof. Muensterberg, who has recently been called to take charge of the graduate work in psychology at Harvard University, and, upon request of the president, addressed the association in German. While the object of his remarks was to outline the problems upon which his students at Cambridge were at present working, the introduction of this description dwelt upon the general point of view that directs the choice of subjects and the method of investigation. Dr. Muensterberg laid stress upon the necessity, not only of accurate answers to problems already stated, but particularly on the discovery of new problems. The difficulty here is more that of asking significant questions than of answering them. The question of the investigations themselves shows what a wide field was being touched upon in various points by the Harvard men—investigations of the methods of localizing sounds in space, a new method of determining when differences of sensation are to be regarded as equal, an elaborate series of experiments on the nature of the association of ideas, of the daily change in mental condition, of complex forms of reaction in which various subjects take part at the same time, and others.—Prof. Jastrow, of the University of Wisconsin, gave some account of what was to be attempted in the laboratory of experimental psychology which has been founded in connection with the World's Fair. The general plan of this exhibit includes a collection of the various types of apparatus that are employed in psychological research; also those that are used in connection with laboratory courses in psychology. A great variety of apparatus gathered from all portions of Europe and America will here be collected, and will cover such

branches of the subject as the tests of the senses, the powers of judgment, the times of mental processes, the nature of the association of ideas, the limits and varieties of memory, the effects of fatigue, the relation of mind and body, and so on. A second important part of the exhibit will consist of a working laboratory, in which tests will be made upon all who choose to subject themselves to them. The tests are necessarily simple in character, and have for their object the determination of normal averages in respect to various forms of vision, of tactile sensation, of times and accuracy of judgment, association and reaction, of the nature of association, and the like. And, thirdly, a department in which results will be exhibited, will attempt to show the practical importance of these investigations and their various applications in the study of child growth, the study of abnormal forms of mental phenomena, and the like.—Dr. Sanford, of Clark University, gave an account of some of the studies in progress there. One of these related to the fluctuation in mental power at different portions of the day, as determined by the capacity to remember a series of arbitrary impressions. Another research gave an account of the frequency and character of the dreams of subjects who at once record their dreams upon awakening from them. The frequency of dreams and their concentration in the early hours of the morning, the large factors that recent events contribute to them, appeared as some of the results of this investigation.—Another interesting paper, presented by Dr. Witmer, of the University of Pennsylvania, gave an account of the research upon the æsthetics of visual form and attempting to answer the question, What are the most pleasing forms and proportions in the great variety of figures and conditions?—A paper by Prof. Bryan, of the University of Indiana, giving an account of the development of motor power in children at different ages, and bringing out many significant and important results, was presented; also papers by Dr. Nichols, of Harvard University, presenting some novel experiments upon illusions of rotation and upon the sense of pain; by Prof. Pace, of the Catholic University of Washington, on the power of judging the thickness of surfaces held between the thumb and forefinger; and papers by Dr. Chamberlain, on the Relation of Psychology and Anthropology, and by Dr. Aikens, on An Analysis of Cause.—The meeting adjourned to next December at Columbia College, New York, the officers of the association being: President, G. Stanley Hall, of Clark University; vice-president, George T. Ladd, of Yale University; and secretary, Joseph Jastrow, of the University of Wisconsin.

Arbitration with English Trades Unions.—The English Labor Commission has completed its examination of the conditions, etc., of every branch of labor, except agriculture, in the kingdom. Its results, embodying the testimony of more than four hundred and thirty witnesses, as summarized by Mr. John Rae, in the Contemporary Review, make it clear that there has been during the last twenty years a remarkable growth in all parts of the kingdom of the institutions that make for industrial peace—the Board of Arbitration, the Joint Committee of Conciliation, and the sliding scale. The Board of Conciliation, the essential feature of which was a full interchange of views between the representatives of the parties — employers and hands—face to face, was started in 1866. The original board, formed by Mr. Mundella for the hosiery trade, was short-lived, but the principle was adopted, and still prevails. The first Board of Arbitration, which provides for binding reference to an umpire in case the conference fails, started in the iron trade by Sir Rupert Kettle in 1869, is still efficient; and a second board, started in 1872, has likewise proved its usefulness and its right to live. Since the establishment of these boards in the northern and midland counties of England, respectively, there has been no strike in the northern district, and only one insignificant strike in the middle district. In fact, "strikes, and even the very disposition to strike, seem to be thoroughly stamped out in this [the iron and steel] industry." In many trades there is a great belief in conciliation, but a great dislike to arbitration. Many think the "long jaw" (as the Conciliation Conference is called) "sufficient to remove all difficulties, and make both parties in the end see eye to eye; but the members of the manufactured iron trade are most decided in counting concilia-

tion incomplete and of very uncertain efficacy without the reference to arbitration in case of disagreement. Employers and employed were equally emphatic on this point. They thought the knowledge of an appeal to arbitration being in reserve was absolutely essential to a successful negotiation at the Conciliation Board. The right of appeal might seldom be used, but in their opinion it must always be there, otherwise, though things might not go so far as a strike, there would be constant worrying and keeping up of a contention." Two rules contribute greatly to the smooth working of the system: one, forbidding any suspension of work at any place under the jurisdiction of the board before the cause of dispute has been submitted to the consideration of the board; and the other, making the board's decision retrospective, so as to take effect from the date of the raising of the point. Both these rules have been observed by both sides in good faith. These boards have further exercised a salutary influence in promoting a more reasonable spirit among employers and employed. "There is very much more reason than there used to be formerly; so much so, indeed, that more disputes are now settled at home without going to the board at all than were settled at home before its establishment, and all in consequence of the growth of habits of reasonable consideration and mutual forbearance, which have been bred through the board."

Symbolical Communication.—Writing of the language of signs or the symbolism in ceremonial and current use among the lower tribes of Farther India, General A. R. MacMahon says: "The chief's special messenger, carrying his carved and ornamented spear as an emblem of authority—potent as a magistrate's seal in other countries—dumb though he be in presence of people to whom his dialect is a foreign tongue, metaphorically speaks in accents that can not be mistaken when he flings down the gauntlet in the shape of the *war-dah* with strip of crimson cloth in token of defiance, or produces the cross or dagger-shaped *plurvi* or wand, made of strips of bamboo, which, simple as it may appear to the uninitiated, under some conditions furnishes the materials for a lengthy dispatch, if reduced to a written medium. If the tips of its cross-pieces be broken, for instance, it signifies a money demand for each fracture. If one cross-piece be charred, it means an urgent summons, directing people to come by torchlight if it arrives at night. A capsicum fixed on the *plurvi* signifies that disobedience to the order will 'make it hot' for the recipient. If the *plurvi* be made of cane instead of bamboo, it betokens that this punishment will take the form of flogging. The smooth, round stone which was all that Lieutenant Wilcox received from the Abora, in reply to interminable verbal negotiations suggesting the advisability of their submission to British authority, was utterly meaningless to that very intelligent officer till interpreted by a rude native of the jungle who happened to be present when the mission arrived. The translation ran thus: 'Until this stone crumbles in the dust shall our friendship last, and firm as is its texture, so firm is our present resolution.' . . . Captain Lervin's policeman, when required to explain why he . . . desired a week's leave, said, 'A young maiden has sent me flowers and birnee rice twice as a token, and if I wait any longer they will say I am no man.'"

Animals and Music.—A curious account of the effects of various kinds of music on different animals is given by a writer in the Spectator. The general order of the experiments, based upon the supposition that animal nerves are not unlike our own, was so arranged that the attention of the animals should be first arrested by a low and gradually increasing volume of sound, in those melodious minor keys which experience showed them to prefer. The piccolo was then to follow in shrill and high-pitched contrast; after which the flute was to be played to soothe the feelings ruffled by that instrument. Pleasure and dislike were often most strongly shown where least expected; and the last experiment indicated stronger dislikes, if not stronger preferences, in the musical scale, in the tiger than in the most intelligent anthropoid apes. With "Jack," a six-months-old red orang-outang, "As the sounds of the violin began, he suspended himself against the bars, and then, with one hand above his head, dropped the other to his side, and listened with grave attention. He then crept away on all fours, looking

back over his shoulder, like a frightened baby," and covered himself with his piece of carpet. Then his fear gave place to pleasure, and he sat down, with smoothed hair, and listened to the music. The piccolo at first frightened him, but he soon held out his hand for the instrument and was allowed to examine it. "The flute did not interest him, but the bagpipes—reproduced on the violin—achieved a triumph." The capuchins were busy eating their breakfast; "but the violin soon attracted an audience. The capuchins dropped their food and clung to the bars, listening, with their heads on one side, with great attention. The keeper drew our notice to the next cage. There, clinging in rows to the front wires, was a silent assembly of a dozen macaques, all listening attentively to the concert which their neighbors were enjoying. At the first sounds of the flute most of these ran away; and the piccolo excited loud and angry screams from all sides. Clearly, in this case, the violin was the favorite." When the flute was played to the elephant, he stood listening with deep attention, one foot raised from the ground, and its whole body still. "But the change to the piccolo was resented. After the first bar, the elephant twisted round, and stood with its back to the performer, whistling and snorting and stamping its feet. The violin was less disliked, but the signs of disapproval were unmistakable." The deer were strongly attracted by the violin, and showed equal pleasure at the tones of the flute. The ostrich seemed to enjoy the violin and flute, though it showed marked dislike at the piccolo. "The ibexes were startled at the piccolo, first rushing forward to listen, and then taking refuge on a pile of rock, from which, however, the softer music of the flute brought them down to listen at the railing. The wild asses and zebras left the hay with which their racks had just been filled; and even the tapir, which lives next door, got up to listen to the violin; while the flute set the Indian wild ass kicking with excitement. But the piccolo had no charms for any of them, and they all returned to their interrupted breakfasts." A sleeping tiger was awakened by the soft playing of the violin near its cage; listened to the music for a time "in a very fine attitude," then "purred," lay down again, and dozed. At the first notes of the piccolo, it "sprang to its feet and rushed up and down the cage, shaking its head and ears, and lashing its tail from side to side. As the notes became still louder and more piercing, the tiger bounded across the den, reared on its hind feet, and exhibited the most ludicrous contrast to the calm dignity and repose with which it had listened to the violin. With the flute, which followed, the tiger became quiet, the leaps subsided to a gentle walk, and coming to the bars and standing still and quiet once more, the animal listened with pleasure to the music."

The Observatory at Arequipa, Peru.—Prof. Pickering, of Harvard Observatory, is well satisfied with the advantages of the South American branch observatory near Arequipa, Peru, eight thousand feet above the sea. During a large part of the year, he says, the sky is nearly cloudless. A telescope having an aperture of thirteen inches has been erected there, and has shown a remarkable degree of steadiness in the atmosphere. Night after night atmospheric conditions prevail which occur only at rare intervals, if ever, in Cambridge. Several of the diffraction rings surrounding the brighter stars are visible, close doubles in which the components are much less than a second apart are readily separated, and powers can be constantly employed which are so high as to be almost useless in Cambridge. In many researches the gain is as great as if the aperture of the instrument was doubled. The observatory is also favorably situated with reference to the southern stars, most of which can not be seen at all from the United States.

Ashamed, yet Faithful.—We have received from Dr. John S. Flagg, of Boston, a curious incident illustrating the operation of something like a moral sense in a dog. One rainy morning in October, 1891, Dr. Flagg observed a setter dog in front of himself, slinking along with his tail and head depressed, and his whole gait one of dejection. He proved to be following a seedy-looking man in a state of reeling intoxication. Being impressed that the dog's trouble was caused by shame at the intoxication of his master and the attention he was attracting,

Dr. Flagg followed the case up. "On reaching the crossing at the head of Hanover Street," he says, "where the traffic is large, the dog lost a little of his dejected air and occupied himself chiefly in getting the man safely across. When his charge was finally over, and meandering down the left-hand side of Hanover Street, then the dog slunk to the opposite side and resumed the shame-faced air I had at first noticed, keeping constant watch with furtive glances on the staggerer opposite. Where Hanover Street crosses New Washington Street, the dog again piloted the man with anxious care. This done, he again declined to be seen on the same sidewalk with him, but slunk along in the shadow of the building opposite. The master turned into Prince Street, when the sense of degradation seeming to be somewhat lessened by familiar surroundings, the faithful animal trotted ahead as pilot to the door. I could not perceive in the dog's attitude any sign of fear of his master, or any evidence of wrong-doing on his own part; everything seemed to show that the one explanation of the dog's behavior lay in his appreciation of the common disgrace caused by the man's condition."

The Use of Lightning Rods.—A discussion, by Alexander McAdie, of the question, Shall we erect Lightning Rods? (Ginn & Co., Boston), in which the arguments on both sides are presented, leads the author to an affirmative answer; and he suggests, to those contemplating the erection of a rod, that they get a good iron or copper conductor, weighing six ounces to the foot of copper, or thirty-five ounces if of iron, preferably of tape form. The nature of the locality will determine in a great degree the need of a rod, as some places are more liable to be struck than others. The very best ground that can be got is after all but a very poor one for some flashes, so that the ground can not be too good. If a conductor at any part of its course goes near water or gas mains it is best to connect it with them, but small-bore fusible pipes should be avoided. The tip of the rod should be protected from corrosion or rust. Independent grounds are preferable to water and gas mains. Clusters of points or groups of two or three along the ridge rod are recommended. Chain or link conductors are of very little use. Slight faith is to be placed in what is called the area of protection. Lightning is much more indifferent than has been supposed to the "path of least resistance." Any part of a building, if the flash is of a certain character, may be struck, whether there is a rod or not; but such accidents are rare with the comparatively mild flashes of our latitudes. The widespread notion that lightning never strikes the same place twice is erroneous, and plenty of cases are recorded to show the contrary of it.

Irrigation in Australia.—Australia, great as is its extent, has but one river system carrying any really important volume of water to the sea. This is the Murray and its large tributaries, which water portions of the three colonies of New South Wales, Victoria, and South Australia, in the southeastern corner of the island-continent. Want of rain and the absence of perennial streams constitute one of the greatest difficulties that settlers on the land, whether pastoralists or agriculturists, have to contend with. Subterranean supplies are, indeed, being found in the form of running rivers from sixty to a hundred feet below the surface, but not hitherto in sufficient quantities to compensate the lack of rainfall and surface water for ordinary purposes in years of drought. Still less is there enough such water to be found to irrigate the arid plains. The only supply at all adequate for purposes of irrigation on any extensive scale is afforded by the surplus water of the Murray system, now carried to the sea, and this surplus is obviously a limited quantity. An attempt to fertilize by irrigation some portion of the land lying within reach of this supply of water has been made in the last four years at what are known as the irrigation colonies or settlements of Renmark in South Australia and Meldrum in Victoria. The scheme was started in 1887 by two brothers, the Messrs. Chaffey, who had had experience of fruit-raising in California, who have obtained the grants and means necessary to enable them to carry out their plans. The properties are subdivided with a view to settlement by individuals on small sections, each cultivator enjoying, upon a co-operative system, the use of the fixed plant of the settlements, not only

for irrigation, but for rendering the fruits of the soil marketable, by processes of drying, canning, wine-making, etc.

The Love of Nature in America.—The London Spectator has learned from the evidence of books on the subject that there now exists in New England a counterpart to the great and growing appreciation of wild Nature which has left such a mark on recent English literature. Even Fenimore Cooper, it admits, "painted the wild life of the woods with a minuteness of detail and depth of feeling that suggests that the readers for whom he wrote were not less in sympathy with the subject than himself. The works of Thoreau and John Burroughs are now American classics; and to judge by the number of recent works similar in kind and object, the appetite of New England grows by what it feeds on. The coincidence by which people of the same race, and living in the same latitude, but on different sides of the globe, are now eagerly expressing in a common language their pleasure and interest in exactly the same kind of subjects and scenes, though the actual birds and beasts, trees and plants, are often as distinct as the two continents in which they are found, is probably unique. There is no such analogy in taste between England and any of her colonies as this common love of Nature which finds almost identical expression in the prose idylls of Jefferies and of Burroughs, and the engravings of Wolf and of Mr. Hamilton Gibson." The Spectator goes on to cite from the books of two or three of our Nature-loving authors, without giving anything like an adequate exemplification of the list. It might also have extended its studies and brought in other sections than New England. Where, for instance, can we find more faithful portraitures of hill and ravine, forest and field, and the moods of Nature in sunshine and storm, frost and flood, than Charles Egbert Craddock has drawn of her loved Tennessee mountains?

The Brooklyn Institute Biological Laboratory.—The last, its third, was the most successful season of the work of the Biological Laboratory of the Brooklyn Institute, at Cold Spring Harbor, N. Y. During its three years of existence more than sixty persons have made use of the advantages afforded by the laboratory, either in study or investigation; and among these have been college professors, public-school teachers, physicians, and students of various grades of schools. Of the three classes of students using the marine laboratories—those seeking a general knowledge of zoölogy and botany, including medical students; college students desiring to do miscellaneous work of a higher character than that of their college, or to study embryology from the practical side; and those who desire to undertake original research—the course of this school has been especially planned for the first two classes. An elementary course in zoölogy is arranged, lasting six weeks; courses of scientific lectures are given by well-known experts; a special line of work in bacteriology methods is offered; and at a certain point students who have taken the elementary course or its equivalent are allowed to plan their work each for himself.

Home Landscape.—An editorial article in Garden and Forest aims to show how beauty in landscape and in our home surroundings grows out of our honest attempts to adapt the conditions of Nature to our wants. In our clearings, orchard and garden planting, and building, so long as we are honest and straightforward in our work, Mother Nature "stands ready to adopt it as her own, and to make of it landscape rich in meaning and pathos, such as no primitive wilderness can show." Look for a moment upon a typical valley of the interior of New England. "We are standing upon the eastern wall of upland. The village, with a mill or two and a church or two, lies below us at the mouth of a gap in the northern hills. Southward the valley broadens to contain a fresh green intervale. Opposite us the western wall of the valley is an irregular steep slope of rising woods, with numerous upland farms scattered along the more level heights above. The central intervale, the flanking woods, the village gathered at the valley's head—the whole scene before us possesses unity and beauty to a degree which interests us at once. And how was this delightful general effect produced? Simply by intelli gent obedience to the requirements of hu man life in this valley. The village grew

what it is for the sake of nearness to the great water power which rushes from the gap in the hills. The intervale was cleared and smoothed for raising perfect hay. The steep side hills have been maintained in woods because they are too steep for agriculture, and because, if they were cleared of trees, their sands and gravels would wash down upon the fertile land of the intervale. Similarly upon the upland farms the greenery along even the tiniest brooks has been preserved in order to obviate that wasteful washing away of soil which results from carrying plowing to the edges of the water-courses. Throughout the landscape before us it is most interesting to note how beauty has resulted from the exercise of common sense and intelligence. The every-day forces of convenience, use, and true economy have here conspired with Nature to produce beauty, and this beauty is of a very different and much more satisfying kind than that which tries to found itself on mere new caprice or fashion."

Perversity conquered.—The story of successful dealing with two cases of idiocy manifesting itself in violence is related by Margaret Bancroft, of Haddonfield, N. J. The first case was a deaf-mute, twenty years of age, "a sickly, wild, destructive, disgusting specimen of humanity," who had to be taken charge of day and night. He would tear or destroy three or four suits a week. An attendant, having noticed that he was fastidious about the color of the things he wore, suggested having fine clothing for him. He was fitted with a suit, and "the success was wonderful. He was perfectly delighted, blew and puffed on his clothes, and from that time, unless some very serious trouble arose with his care-taker, he never destroyed anything unless it was ugly. He was gradually led on from one step in good behavior to another—sitting to witness a play, being photographed, sitting in school during the opening exercises, drawing lines, and mat-weaving, in which, when he threaded his needle and put in one row without help, the whole school set up a hurrah. "There were many ups and downs, but from that time improvement was constant" till boy and teacher were separated in consequence of the burning of the school building. The success is a subject of wonder to all who know of the case. "It has taken unbounded patience, hopefulness, and trust, but the great secret has been love, our love for him and his love for us and trust in us." The other case was a boy who had been hurt mentally by a fall, a destructive, murderous savage, with whom, "for some time after his arrival, we felt that we had a young tiger in our peaceful home.... The first attempt to have him in the school-room was a tempest." He was tied in a chair and had to be held by two persons; then he had only to be tied; but, "after six months of this work, we could have him in the school-room untied for a short time. It was so in everything we attempted to do with him; in teaching him we were obliged to have one person hold him while another directed his hands. So on until we gradually got him to like his work. In marching, calisthenics, games, kindergarten work, chart work, board work, slate work, there were the same battles week after week; but now he leads the marching.... He is trying in all his work to use his right hand, but it is a great effort, and requires the exercise of patience on his part. He is loving and neat, takes great pride in his clothes, says his prayers, and tries to please.... We are proud of his table manners."

Plains in Cold Countries.—In his book on Ancient and Modern Steppes and Tundras, Prof. A. Nehring undertakes to show that such formations are marks of the post-glacial transition period, the analogues of which can be found in the central regions of Europe and North America, and even in the South. The heaths of central Europe, the *pusztes* of Hungary, the African deserts, North American prairies and savannas, and the pampas and llanos of South America, are, according to his view, all of one class with them. Their common characteristic is not the desolation we usually conceive when the steppe or the tundra is mentioned, which is only a topographical incident, but the limitation of vegetation to herbaceous plants with scarcity of trees, and a general flatness or moderately undulating character of the surface. Sometimes island elevations occur in them, which are covered with trees, and whence streams flow. They are not depressions, but often constitute table-lands or cap the tops of mountains or high hills. As de-

scribed by Prejevalski, some of the Siberian steppes in spring appear like immense flower beds of various colors, with wood-clad hills of dark pines or dwarf birches rising from among them. Our prairies present this floral exuberance through most of the summer, but on the thinner soil of the steppes it usually dies out under the intense heat, while in winter the region is subject to the other extreme of excessive cold. Rain is more abundant in the steppes than in the northern tundras. It falls chiefly in summer, in violent showers, which do little permanent good to vegetation. In the north, the water, prevented by the perpetual ice in the subsoil from percolating through it, forms the marshes characteristic of the tundras. Another feature common to steppes and tundras is that of raging snow-storms or *buranes* (blizzards ?), or high winds with or without snow. These winds, charged with sand, dust, and snow, sweep away or destroy everything they meet, and deposit in curious formations alternate strata of sand and snow. The animal life of the tundras includes animals that live in them constantly, and those that visit them from other regions. Of the former class are the lemming, the arctic fox, and the snow hare in the tundras, while the characteristic animals of the steppes are the arctomys, the jerboa, and the spermophilus. It was the discovery of numerous remains of these animals in central Europe that suggested to Nehring that all the prairie formations may have had a similar origin. The objections which have been brought against this theory, which are not without weight, are ingeniously answered by Prof. Nehring in his book.

A River's Work.—Regarding the varying phases of a river's work in its passage from the form of a mountain torrent to that of a broad estuary, Mr. Albert F. Brigham remarks that transportation begins at the head waters, and continues, always important, to the ocean. Corrasion (wearing away) is active in the torrential stage, and passes practically down to zero in the lower course of the stream. Deposition begins at the end of the torrential section, and prevails strongly to the ocean. In the middle or terrace section the forces approximate an equilibrium. The river lays up its waste in its banks, only to load it up again after months or years, and carry it a stage farther toward its destination. Somewhere in descending our stream we pass the critical point between land destruction and land building. Above this point materials are gathered up; below they are strewn down."

Surviving Superstitions.—The more sober and matter-of-fact the people, says an essayist in the London Spectator, the more curious are the superstitions that survive among them, in spite of their common sense. It is not only the ignorant sailor before the mast who regards Friday with superstitious dread. His captain and several other well-educated men share in the feeling. The superstition concerning thirteen at the table is perhaps more widespread than any other. A hostess who deliberately made up a party of thirteen would be a bold woman indeed, for two or three of her company would object to dining at her table. Many people will positively assert that they have actually known cases in which one of a party of thirteen at dinner has died in the course of the year—and with perfect truth, probably; for, taking the average age of the assembled guests to be thirty-five or over, the mathematical chances of death occurring among them within a year are rather more than one in thirteen. The chance of a death would be even greater if there were twenty, and would amount to almost a certainty in the case of a hundred—an excellent reason for abstaining from public dinners! The same writer gives as the origin of the superstition against passing under a ladder the circumstance that in the old days the man to be hanged had to pass under the ladder which stood against the gallows for the convenience of the executioner; "and he passed under that ladder with the fair certainty of being immediately hanged." The superstition concerning the spilling of salt dates from the most distant antiquity. "Salt, the incorruptible and the preserver from corruption, the holy substance that was used in sacrifice, could not be rudely spilt or wasted without incurring the anger of all good spirits and giving an opportunity to the evil ones. Now, the evil spirit lurks, as a rule, somewhere behind a man upon the left side, so that it is desirable, if one wishes to avoid the consequence of carelessness, to

throw the salt over the left shoulder three mystic times and discomfit the wicked one exceedingly. It is interesting to view the grave solemnity with which the intelligent and well-educated woman of to-day will perform that ceremony."

Rock Striation by River Ice.—A study of the striation of rocks by river ice has been made by Mr. J. E. Todd in the Mississippi and other Western rivers. While not much attention has been paid to this agency, the author finds that planation and striation are sometimes the work of river ice armed with erratics; that the situations most favorable for the phenomenon seem to be on the outside of a bend, or near a strong current, near low-water mark, and below a point where siliceous erratics lie near the water-level. The dynamical conditions necessary are probably a sudden breaking up of the ice before it is rotted by thawing and a flood to wield it. The proper conditions do not often occur in our present Western streams. Usually the striæ are parallel, as much so as in glacial action, and commonly on surfaces dipping up stream, but occasionally upon limited areas dipping down stream. While these facts, the author observes, may have no direct significance of practical value, they indirectly throw much light upon the possible origin of the extra-morainic drift and of some ancient striated surfaces outside of the moraines.

Animals not Afraid of Man.—Mr. W. H. Hudson's observations of birds in La Plata lead him to different conclusions from those which Darwin and Herbert Spencer have reached respecting their supposed instinctive fear of man or birds of prey antecedent to experience or parental teaching. The one thing that is instinctive, says Mr. Alfred R. Wallace, in his review of the book, "is the alarm caused by the warning note of the parent. This produces an effect even before the chick is hatched, for in three different species belonging to widely separated orders Mr. Hudson has watched the nest while the young bird was chipping its way out of the egg and uttering its feeble *peep*, when, on hearing the warning cry of the mother-bird, both sounds instantly ceased, and the chick remained quiescent in the shell for a long time, or till the parent's changed note showed that the danger was over. Young nestling birds take their food as readily from man as from their parents till they hear the warning cry, when they immediately close their mouths and crouch down frightened in the nest. Parasitical birds, which do not recognize the warning cries of their foster-parents, show no fear. The young parasitical cowbird takes food from man, and exhibits no fear, although the foster-parents are hovering close by, screaming their alarm notes. So a young wild dove, reared from the egg by domestic pigeons, which, never being fed, were half wild in their habits, never acquired the wildness of his foster-parents, but became perfectly tame and showed no more fear of a man than of a horse. He had none of his own kind to learn from, and did not understand either the voices or the actions of the dove-pigeons. Mr. Hudson has also reared plovers, tinamous, coots, and many other wild birds from eggs hatched by fowls, and found them all quite incapable of distinguishing friend from foe, while some, such as the rhea and the crested screamer, are much tamer when young than domestic chickens and ducklings. Mr. Hudson concludes that birds learn to distinguish their enemies, first, from parental warnings, and later by personal experience.

The Truffle.—In a book on that vegetable, lately published in France, M. Ad. Chatin defines the truffle as a mushroom, which is not a parasite, though it grows by preference in the immediate vicinity of certain kinds of trees; and like its congeners, the tuberaceous mushrooms, instead of living in the air it is hypogeous. The truffle is first mentioned by Theophrastus, who calls it *mizy* and *mison*, and regards it as a rootless plant engendered by the thundershowers of autumn, but capable, according to many observers, of reproducing itself from seeds brought by storms from Tiaris, on the shores of Mitylene. This truffle, that of Lesbos, was an inferior variety to the truffle of Périgord, which is so highly prized by epicures. The truffles of Algeria, called *terfas*, and those of western Asia, called *kamés*, although not equal to those of France, are of considerable importance as food to the Arabs. M. Chatin has added several species, previ-

ously unknown, to the truffle of all these countries, and a new genus, the *Tirmania*, to those of Africa. The history of the truffle, as old as that of civilization, begins with the most brilliant days of Greece and Rome, was lost in the darkness of the middle ages, and revived with the Renascence; and at a later period the delicacy spread from the court to the tables of the rich, and is now known in all ranks. Scientific acquaintance with the plant has enjoyed a growth parallel with that of its alimentary use, and with methods of cultivation, which are wholly of modern origin, having been established as the result of the scientific investigations of the present century. According to the latest statistical report of the truffle crop, the total production was valued, for the year 1889, at $500,000.

Superstitions about Saturn.—The somewhat dull and heavy appearance of the light of Saturn as compared with that of the other planets and of the stars of the first magnitude may, according to Paul Stroobant, of the Royal Observatory of Belgium, help to account for the baleful influence which the ancients attributed to it. Recognizing it as the most remote of the planets with which they were acquainted, they paid it a special regard. The Assyrians included the sun, the moon, and the five planets known to them among the superior divinities, calling them the interpreting gods; and of these Saturn was the chief interpreter or revealer. They called it Nisroch or Asshur, the god of time or the year. Similar ideas prevailed in ancient Egypt. Julius Firminius, speaking of astral influences over the dispositions of men, says, "if one is born under the influence of Mercury, he will be addicted to astronomy; if under Mars, he will embrace the profession of arms; if under Saturn, he will devote himself to alchemy." This planet was regarded by the Egyptians as a foreign divinity, for its altars were built outside of the cities, among those of the adopted gods. Probably this usage came from the North, for Plutarch, who locates the island of Ogygia in the North, says that its people, every thirty years, when Saturn went into the sign of Taurus, sailed away to sacrifice in another country. The Greeks regarded Saturn as the god of time. Latin texts represent Saturn as a planet dangerous to human life, and say that it brings rains and four-day fevers. This planet likewise played an important part in the astrology of the middle ages. It was certainly known to the Chinese 2500 years B. C., for they then had ephemerides of the five older planets. Egyptian monuments of the fifth and sixth dynasties mention it. The most ancient precise observation of Saturn known was made by the Chaldeans in the year 579 of the era of Nabonassar. Ptolemy fixes this on March 1, B. C. 228. Ptolemy observed an opposition of Saturn A. D. 127, which was the basis for his determination of the elements of its orbit. The sign ♄, employed to designate Saturn, was not known to the ancients. Laland derives it from the sickle of time. Some persons believe that it stands for the figure 5, answering to the place of the planet in the order of the system, as the sign 2ƒ of Jupiter may stand for 4. Alexander von Humboldt says that the signs for the planets are no older than the tenth century. Different opinions prevail as to whether or not the ancients had any knowledge of Saturn's ring. It is hardly probable.

Jokes by Animals.—Among the incidents of jokes played by animals upon one another cited by a writer on The Animal Sense of Humor, in the London Spectator, is that of a jackdaw which, whenever it found its setter-dog companions asleep, would steal up to them and pull at the little fluffy tassels of hair between their toes—where the animal was more sensitive than in other hairy parts of its body—unpleasantly waking them up. At a certain house, a tame magpie was kept in the stable yard with two kestrels. The kestrels were in the habit of sitting on the sides of the water pails that stood outside of the stable doors. At one time the magpie approached a kestrel from behind, seized its long tail in its beak, jerked it violently, and pushed it over into the pail; but the kestrel afterward caught the magpie and punished it well. A cat expressed its dislike of a peacock by jumping through its spread-out tail when the bird was displaying its beauty and exhibiting its own vanity, to the great discomfiture of the fowl. The writer's dog, which was accustomed to hunting rabbits, showed its displeasure when its master had

shot a bullfinch by going into the hedge, finding a rabbit, and bringing it to him. Another dog, which knew tame ducks and that they were not hunted, but had no acquaintance with wild ones, was much disgusted when its master shot a teal, believing he had made a mistake, and would have nothing to do with the game. "He behaved in exactly the same way when we shot a black rabbit; nothing would persuade him that it was not a cat; and he would do no serious work for the rest of the day." The writer tells also of dogs that thought it beneath their dignity to chase rats, except when their masters were engaged in the sport; and he speaks of the very obvious dislike of dogs to be laughed at.

Suicidal Ingenuity.—A curious list and description of ingenious methods which insane patients with suicidal tendencies have adopted for disposing of themselves is given by Dr. H. Sutherland in a paper on the prevention of suicide in the insane. Patients with suicidal tendencies should be put under surveillance and constant attendance at once. Care must be taken against all imaginable and even some unimagined things with which they might contrive to kill themselves—medicines, pills, lotions, and plasters, and the patients' taking the prescribed doses, should be looked after, lest they by some craft accumulate a quantity sufficient to kill and take it all at once; keys, razors, knives and forks, fire-irons, even brooms, broken glass, and crockery, should be kept out of their hands; and nails, wires, ropes, sash-lines, bell-pulls, tapes, and string, lest they hang themselves. Even a piece of slate pencil or an old spoon may be used for the purpose of strangulation, by being attached to a string and then pushed through a keyhole and pulled taut. Patients working at their trades require constant watching and daily examination, for their tools and materials may be made to afford facilities for killing themselves. In fact, the ingenuity of these people can be matched only by ingenious vigilance and alertness.

Camphor.—The camphor tree, according to the United States consular report from Osaka, Japan, is a tree of the laurel family growing in southern Japan, the wood of which is valuable in ship-building. It grows in mountainous regions far from the sea. It is a well-proportioned, handsome evergreen, its elliptical, slightly dentate leaf turning a lighter color for one or two months in the spring. The berries grow in bunches. The tree is cut down for the collection of the camphor, but the law requires that it be replaced by another. It is then cut up into chips and steamed. The camphor and oil extracted by the steaming are passed through a connecting tube into a second receiver, and thence into a third, which is divided into two compartments, one above the other. These compartments are separated by a perforated partition, which gives passage to the water and the oil, while the camphor is deposited on a layer of straw provided for it. It is then separated from the straw and prepared for sale. The oil which is drawn out from the lower compartment is used for illumination.

NOTES.

The ethnographic exhibit at the Chicago Fair will be partly within the main building and partly outdoors—the collections being within and other features without. The American department will include specimens of native tribes living their usual life and engaged in their usual occupations; relief maps of the most famous earthworks of the Mississippi Valley; models of the mysterious structures of Yucatan and Central America, with casts of the hieroglyphics; Peruvian mummies; palæolithic implements and relics of the mound-builders; photographs of mounds and ruins from Alaska to Tierra del Fuego; illustrations of primitive religions, games, and folk lore; and numismatic, zoological, geographical, and natural history collections in general. Arrangements are being made to have the State historical exhibits placed in this department.

Since noticing Mr. Edward Atkinson's book on The Science of Nutrition, we have received a good many letters asking where the work can be obtained, information that we were unable to give when the notice was printed. We can now state that Messrs. Damrell & Upham, 283 Washington Street, Boston, are the publishers, and the price of the book is fifty cents.

An address on The Railroad in Education, delivered by Prof. Alexander Hogg, of Fort Worth, at the Texas Teachers' Association, in 1883, attracted attention at once by the breadth of its views and the novel suggestions it embodied. It was delivered again—rewritten—by request of the Commissioner

of Education before the Congress of Educators at the New Orleans Fair in 1885, and has been published in various editions since. The author is now preparing a new edition for the Chicago World's Fair, in which several of the chapters will be rewritten and other chapters added on Fast Running and The World's Fair itself.

THE Eleventh International Congress of Medicine will meet in Rome, September 24 to October 1, 1893, and will be divided into nineteen sections. The price of membership for physicians and men of other professions interested in the labors of the Congress will be five dollars. The official languages of the Congress will be Italian, French, English, and German, and official bulletins of proceedings will be published daily in those languages. Papers and communications for the Congress must be announced by June 30th, and abstracts must be sent to the committee by July 31st. Dr. A. Jacobi, 110 West Thirty-fourth Street, New York, is chairman of the American Committee of the Congress.

A PAPER read before the Society of Arts by F. Seymour Haden, in a temper decidedly not judicial, is devoted to the vindication of earth burial as the best method of disposing of the dead, and to the condemnation of cremation as involving the possibility of criminal poisoning passing often undetected by the destruction of all the evidences of it; while they would be preserved and accessible for a substantially unlimited time under any method of burial. Much of the paper is devoted to showing that burial in destructible casings instead of practically indestructible ones, as under the present system, insures the speedy, harmless restoration of all the elements of the body to their normal condition, and is free from all the objections that may be urged against the present system or against cremation.

AN incident related recently in the Trinidad Field Naturalists' club goes to indicate that the bite of the tarantula is not especially poisonous. A laborer was badly bitten in the foot, and was much frightened. He was taken to the infirmary, hopping all the way on the other foot; a fomentation of water and spirits of ammonia was applied, and he was given a dose of ether mixture. He ate his dinner heartily about two hours later, and slept well at night. In the morning he complained of no pain, and went to work as usual. No local swelling or inflammation was observed, and but little pain at any time. Fright was the only ill effect.

PROF. CAHN, of Breslau, claims to have found the immediate cause of the spontaneous combustion of hay in the heat-producing action of a parasitic fungus called *Aspergillus fumigatus*, a plant already known to be destructive to the germination of barley by the heat it produces. A heat of 95° Fahr. having been already induced by the natural chemical changes, the aspergillus steps in and raises the temperature to 140° Fahr., after which combustion is almost inevitable.

A THEORY, founded on the earlier analyses, that peach yellows was caused by a deficiency of phosphorus and potash, prevailed several years ago, and a treatment with bone phosphate, muriate of potash, and kieserite, based upon it, was in vogue for several years. Analyses made during the last four years, under the direction of the Department of Agriculture, while they agree among themselves, are contradictory of this theory. Experimental evidence, derived from opposite modes of treatment of peach trees, presented by Dr. Erwin F. Smith, in a paper on The Chemistry of Peach Yellows, is likewise contradictory of and depreciatory of the value of the treatment based upon it; and the conclusion is declared by Dr. Smith that we are to look for the cause of peach yellows and the means of prevention in a different direction.

YAWNING, which is regarded by most persons as merely a sign of weariness or sleepiness, is considered by M. Naegeli as a therapeutic agency. He believes that a series of yawns, with the stretching that accompanies them, would make an excellent morning and evening exercise. The lungs can not fail to be benefited by the inflation they get.

ACCORDING to Mr. George A. Allen, the Mohaves believe that the spirits of their dead go up in smoke to the "White Mountain" when their bodies are cremated, and that property which is thrown into the flames goes up with them. They also have a belief that all the Mohaves who die and are not cremated turn into owls, and when they hear an owl hooting at night they think it is the spirit of some dead Mohave returned.

THE Smithsonian Institution has printed a paper by Dr. J. F. Snyder describing an urn containing incinerated human bones, which was dug out of an ancient mound in Georgia. The urn or vase is nearly conical, eleven inches and a half high, and was covered by an inverted bell-shaped vessel fifteen inches and three quarters in height. The ashes nearly half filled the vase, and mingled with them were calcined human teeth and fragments of bones. Lying on the surface of these remains were a quantity of wampum and several small pearls that had been pierced for stringing.

MANY farmers in cutting potatoes for planting take care to follow some rule in regard to the number of eyes to a piece. Experiments made last summer at Purdue University Experiment Station show that the number of eyes is immaterial, even eyes that are cut in two sending up plenty of good stalks, but that the weight of the pieces is the important matter.

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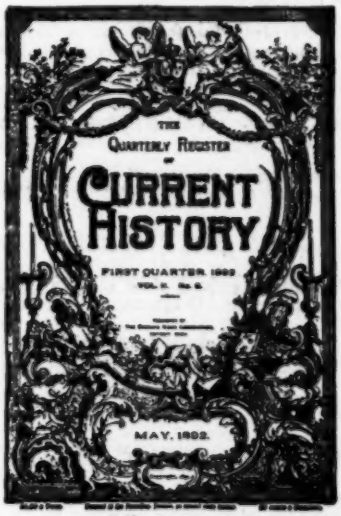

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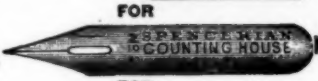
ACCOUNTANTS  No. 2

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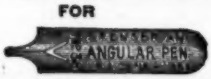
ENGROSSING  No. 36

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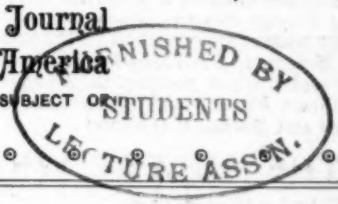

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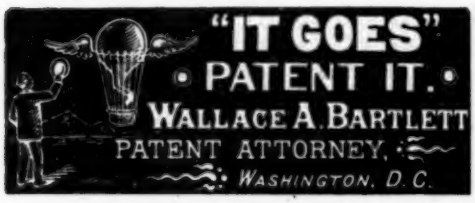

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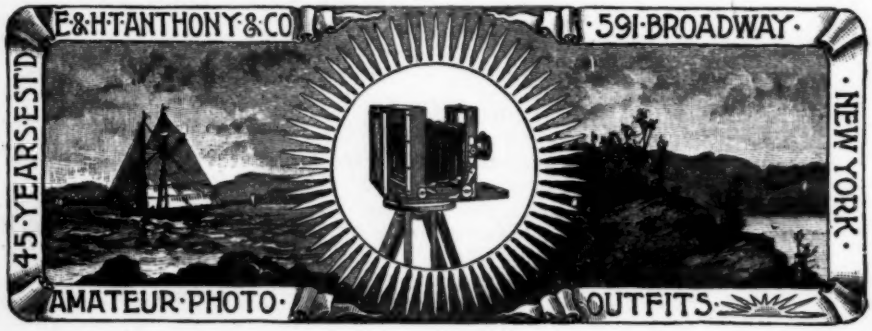

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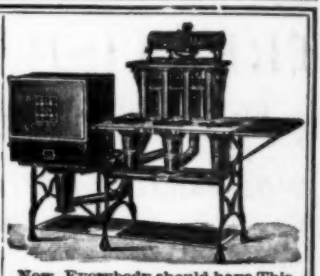

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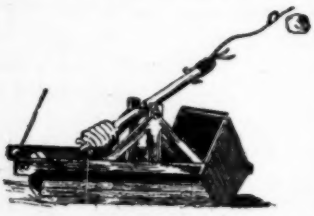

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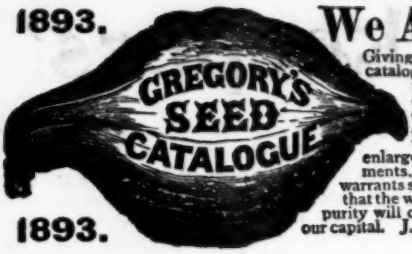

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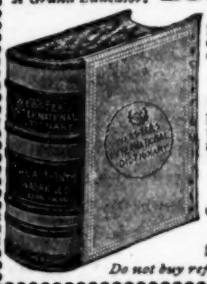

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APRIL, 1893.

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Bonds and Mortgages	24,236,785 51	
Loans secured by collaterals (market value of Securities held as collateral, $5,059,690)	3,916,000 00	
Premium Loans on existing Policies (the Reserve on these Policies, included in Liabilities, amounts to over $4,000,000)	1,096,859 03	
Cash in Office and in Banks and Trust Companies	4,201,283 68	
Interest and Rents due and accrued	971,810 14	
Net Amount of uncollected and deferred Premiums	3,865,275 37	
TOTAL ASSETS		**$137,499,198 99**

LIABILITIES.

Reserve on outstanding Policies, at Actuaries' 4 per cent as per Certificate of New York State Insurance Department, including additional Reserve on Annuities and accumulation Policies voluntarily set aside by the Company	$119,075,888 00	
Losses awaiting proof or payment	1,270,984 81	
Matured Endowments due and unpaid (claims not presented)	67,244 29	
Annuities due and unpaid (claims not presented)	58,036 99	
Unpaid Dividends due Policy-holders	101,363 18	
Premiums paid in advance	75,693 42	
Trust Deposit, held for account of beneficiaries under terms of Policies	45,040 20	
Total Liabilities		**$120,694,250 89**
Net Surplus per Certificate of Insurance Department		**$16,804,948 10**

INCOME.

Premium Receipts	$25,040,113 93	
Interest, Rents, etc	5,896,476 90	
Total		**$30,936,590 83**

DISBURSEMENTS.

Losses paid	$7,896,589 29	
Endowments matured and discounted, paid	1,114,301 99	
Annuities paid	1,370,130 30	
Dividends paid	1,408,219 58	
Paid for Purchased Policies	2,202,771 17	
Installment paid on Trust Deposit	3,000 00	
Total Amount paid to Policy-holders	$13,995,012 33	
Paid to Insurance Depart't for Expenses of Company's Investigation	33,502 19	
Commissions, Brokerages, and Payments to Agents	4,178,316 60	
Agency Expenses	1,076,186 34	
Physicians' Fees, Advertising, Stationery, and Printing	775,059 84	
Salaries to Officers and Employees, 518 in number	579,127 20	
Law and Office Expenses, Rents, and Repairs and Care of Real Estate	712,570 68	
Taxes in the State of New York and other States	304,515 52	
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In force, December 31, 1892	224,008	689,248,629 00
Gain in 1892	**30,556**	**$60,165,451 00**

NOTE AS TO STATEMENT.—The above Statement corresponds in all respects with the Official Report of the Company as it will be published by the State Insurance Department. No Assets, not acceptable under the law of the State, or the Regulations of the Department, are included, and the SURPLUS ($16,804,948 10) IS THE EXACT SUM THAT WILL BE SHOWN BY THE SUPERINTENDENT'S ANNUAL REPORT.

JOHN A. McCALL, President.

HENRY TUCK, Vice-President.
A. H. WELCH, Second Vice-President.
G. W. PERKINS, Third Vice-President.
R. W. WEEKS, Actuary.
C. N. JONES, Associate Actuary.
H. C. RICHARDSON, Assistant Actuary.
E. N. GIBBS, Treasurer.
H. S. THOMPSON, Comptroller.

C. C. WHITNEY, Secretary.
T. M. BANTA, Cashier.
J. A. BROWN, Auditor.
D. P. KINGSLEY, Superintendent of Agencies.
A. HUNTINGTON, M. D., Medical Director.
S. H. CARNEY, M. D., Associate Medical Director.
M. L. KING, M. D., Assistant Medical Director.
O. H. ROGERS, M. D., Assistant Medical Director.

TRUSTEES.

WILLIAM H. APPLETON, C. C. BALDWIN, WILLIAM A. BOOTH, WILLIAM F. BUCKLEY, JOHN CLAFLIN, CHAS. S. FAIRCHILD, EDWARD N. GIBBS, WILLIAM R. GRACE, WM. B. HORNBLOWER, WALTER H. LEWIS, WOODBURY LANGDON, JOHN A. McCALL, WILLIAM C. WHITNEY, HENRY C. MORTIMER, RICHARD MUSER, AUGUSTUS G. PAINE, EDMUND D. RANDOLPH, HIRAM R. STEELE, WM. L. STRONG, HENRY TUCK, A. H. WELCH,